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THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
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A BRASS GOODS MANUFACTURING PLANT

THE CONSTRUCTION AND EQUIPMENT OF A MODERN PLANT FOR THE PRODUCTION OF PLUMBING, STEAM, GAS AND A GENERAL LINE OF BRASS GOODS.

BY P. W. BLAIR.*

In a great majority of cases the brass manufacturing plants of this country have been the result of growth and progress, more or less rapid, of the business which they were designed to accommodate. In a number of cases they began with very meager facilities and with all the conveniences and accessories of the plainest kind. If the

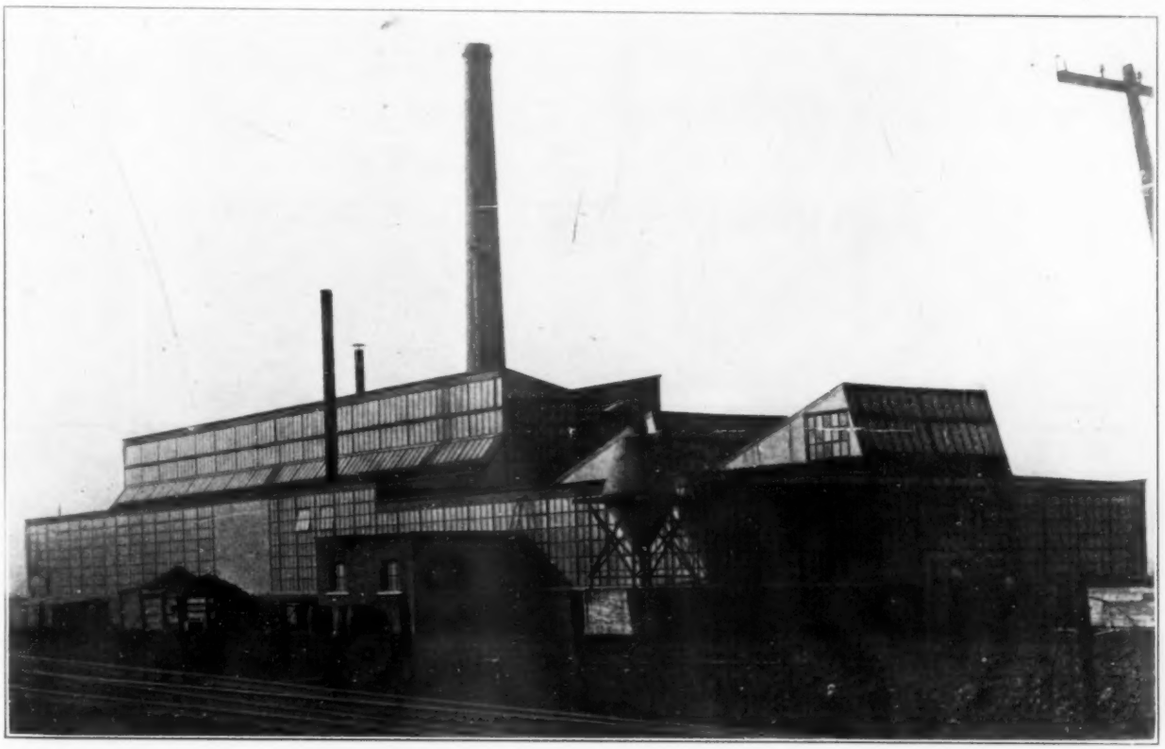

FIG. 1. VIEW OF BRASS FOUNDRY, COREROOM AND CLEANING ROOM AT THE PLANT OF THE MUELLER MANUFACTURING COMPANY AT SARNIA, ONTARIO, CANADA.

founders of these concerns were to see the plants with the modern and up-to-date equipment of the present day they would stand and weep in amazement. As the business increased greater means were available and the buildings demanded were gradually added and other facilities increased. Buildings were enlarged by increasing their height and by the addition of wings; often disconnected and without any apparent plan or consideration of their usefulness. Thus the plant became mixed up, requiring a much greater expense for the handling of stock, material and product.

It may be said that the necessity for comprehensive plans could not have been forseen as the growth of some of the concerns have been slow and gradual and at the head of the directors of the leading brass manufacturing concerns today are some of the leading conservative business men of this country.

It may be said that the modern development of the construction of manufacturing buildings has so changed within the past ten years in character that it would have been impossible for the early builders to have profited by the formulating of a plan in general equal to the growth of their business.

The world progresses and nowhere is this more apparent than in the manufacture of plumbing and steam brass goods. That which would satisfy the plumbers,

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engineers and consumers ten years ago is among the "back numbers" of today. The constant striving for design and quality was never more in evidence than at the present time among up-to-date manufacturers who are

FIG. 2. THE POWER HOUSE.

The most up-to-date manufacturing buildings of the present-day are constructed of iron, steel and glass, magnificent in appearance and costing princely sums to erect. They have been popularly called fireproof, yet the burning of their contents or the effects of the conflagration of buildings near them has often warped, twisted and bent the metal work of their construction.

The modern building for manufacturing brass goods is composed of three stories built of brick, wood and steel. When several floors are necessary they are separated as much as possible by automatically closing hatches for elevators, by protecting stairways with non-combustible partitions, by avoiding light, wooden partitions as much as possible and by using metal and avoiding varnish or other rapidly burning finishes on ceilings or partitions.

POWER.

In considering the question of power and its transmission to the different departments in the plant where it will be required, it has been found that a central power house is the best solution of the problem. Fig. 2 shows an outside view of a modern power house and engine-room. Power is transmitted from the engine to dynamos from which the electric current is transmitted by proper conductors to motors in each department which in turn drive main line of shaftings.

Compressed air has come into such universal use in the foundry and in the manufacturing brass goods, in operating machines, devices, etc., that it plays an important part and can be transmitted without any loss such as steam is subjected to by condensation. The whole plant can be supplied from power house where the compressor is operated under the care of an engineer. The equip-

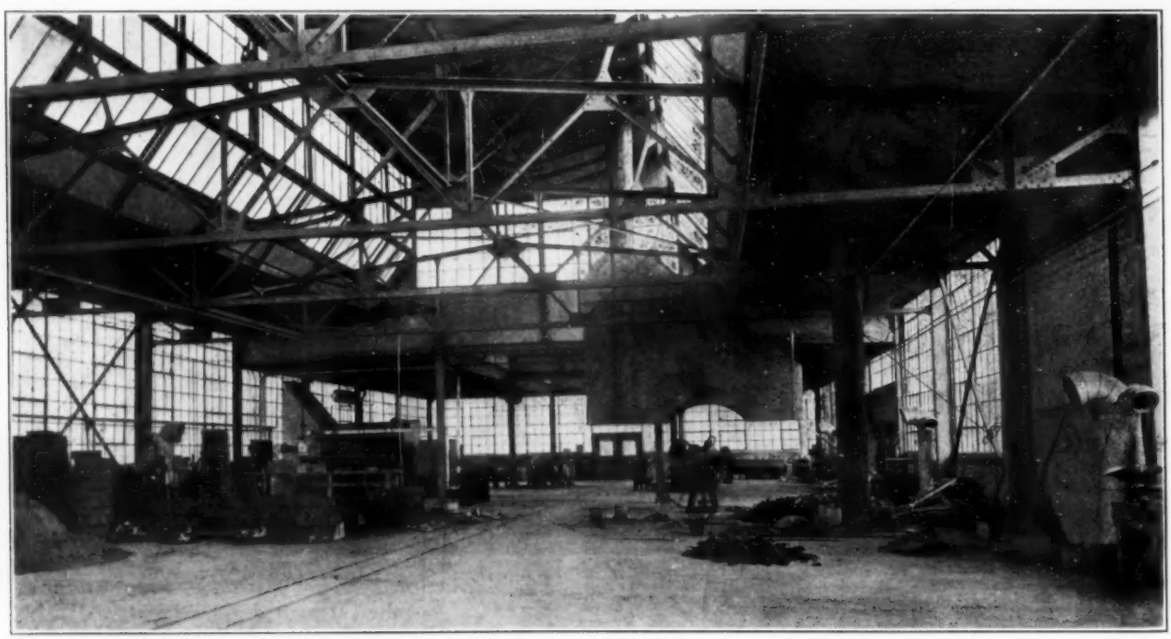

FIG. 3. VIEW OF PART OF THE BRASS FOUNDRY.

able to look beyond the first cost to the greater advantage to be gained later on.

In the arrangement of the general plans for the buildings and departments composing the plant the compact form capable of easy expansion is likely to be the most useful one. It is much easier to design the buildings and to arrange them in their relation to each other if you have ample area in which to do so.

ment of the brass foundry necessarily differs in many respects from that of the other departments as to its product, its work, and the necessary arrangements for carrying it on.

In these later years the application of electricity, the sand blast system for cleaning castings, the tilting, open-flame oil, or gas furnace, for melting metals and the molding machines have rendered the work less laborious and

the output much larger. At the same time the quality of the work both in its practical and in its artistic features has been greatly improved and more economically produced. Fig. 1 shows an outside view of a modern, up-to-date brass foundry core-room and casting and cleaning department.

With brass foundry and core-room design, the foundry efficiency is intimately associated. The illustration shows a foundry built of brick, steel and glass as permanency makes for efficiency in a brass foundry. Light, ventilation and sanitation are the main factors as well as equipment for the production and prime factors of efficiency in a brass manufacturing plant. Every movement or device for facilitating production should be given consideration in the layout of a foundry. A large variety of molding machines are on the market, many of which are admirably designed to turn out a large quantity of work in a day. These machines must be selected and provided in accordance with the particular class of work to be done as their utility will depend almost entirely upon this matter.

Ample provision, should be made for carrying a stock of molding and core sands that can be available at all seasons of the year. The furnaces should be located in the central part of the molding division so as to get out hot metal and convey it to the molds in as short a time as possible.

The tilting, open-flame oil furnace is the recognized method of melting in use with a nautral draft furnace of a capacity of two No. 50 crucibles to be used on special alloys or in case of emergencies. The equipment for melting and pouring in the shape of tongs, skimmers, poling and chipping rods and pouring bars should always be in the best of condition. A liberal supply of iron flasks should always be on hand. The casting cleaning department should be equipped with power sprue cutters, and pneumatic jolters for removing the sand from cores inside the castings, emery stands for grinding fins off of the castings and tumbling barrels for cleaning castings.

Fig. 3 shows a view of the inside of part of a modern brass foundry. The core-room should have plenty of ventilation and be provided with solid double benches and set on a solid foundation to avoid any jarring and should be equipped with a sand mixing and a rosin crushing machine. Steel racks for the storage of the cores after they are baked in the ovens should be provided with suitable metal trays to avoid any loss through breakage and for convenience to the molder.

Fig. 4 shows a view of one side of a core-making department. The remarkable development which has taken place in the manufacture of brass goods and the economic usages in shop practice in manufacture demands the selection of a site with a railroad track near the plant and a branch from the main line along the side. Such an arrangement results in a great saving in the hauling of metals, new machines and material of every description.

FIG. 4. THE CORE-MAKING DEPARTMENT.

LAYOUT OF DEPARTMENTS.

We will next proceed to lay out the different departments to carry out the manufacturing end bearing in mind that much will depend on their proper location in a three-story building. It is necessary to so arrange, that when materials or castings come into the plant they shall pass as nearly as may be in a continuous route from the rough state to their final destination with little or no retrograde movement or other unnecessary handling.

The rough castings are delivered from the casting storage on the first floor to the machine department on the third floor and travel down to first floor as the work progresses. Turret lathes, forming lathes, automatic and hand screw machines and the large variety of similar machines now in use are to be found in almost every brass shop making any pretense to modern equipment and up-to-date methods of doing work.

In all the operations of manufacturing brass goods from the very conception of the idea that you intend to manufacture a certain line of goods and the marketing of that product, if you are to expect success you must first of all have a well conceived definite and comprehensive plan in mind. The location of the different

machines so that the work will follow in rotation or sequence is a prime factor in manufacturing brass goods. The entire third floor is devoted to machining and assembling.

The second floor is devoted and divided into three departments comprising polishing, buffing, nickel-plating as one and tool-making as another, with pattern-making the third.

Fig. 5 illustrates a polishing and buffing section. Small parts when completed are taken to the finished parts storeroom, which is located in the front end of the second floor and is arranged with shelves and alcoves of steel for the reception of the different parts while the opposite side is reserved for somewhat larger parts or collection of parts as may be necessary. To facilitate production an assembling department is located near the polishers and buffers to take care of all work that is polished before assembling.

There has come into general use within the past few years an experimental department which is located in the brass shop on the third floor where all experimental special or jobbing work is done. It is equipped with a variety of machines suitable for experimental work and it is unnecessary to disturb the regular production end of the business as they take care of that end only.

Such a department is a necessity to a plant aiming at progress and keeping up with the times as work of this kind costs too much if done in the regular routine.

The tool storage or distributing and finished parts storeroom are metallic structures enclosed with wire netting and are in control of a designated person who is held responsible for the distribution of tools and material. A general stock-room and receiving department should be located in one end of the first floor and in such room all purchased stock and material of every description is under his supervision. The stock usually found in a brass manufacturing plant is very varied and comprehensive, some of it such as oil, cotton waste and chemicals are very dangerous and a small fireproof addition can be projected out from rear of first floor.

Whenever material is required from the stock department in small quantities a conveyor consisting of two chains running over pulleys at the upper and lower floors and provided with pivoted boxes located between them is very efficient and economical. All large deliveries are made use of by the freight elevator.

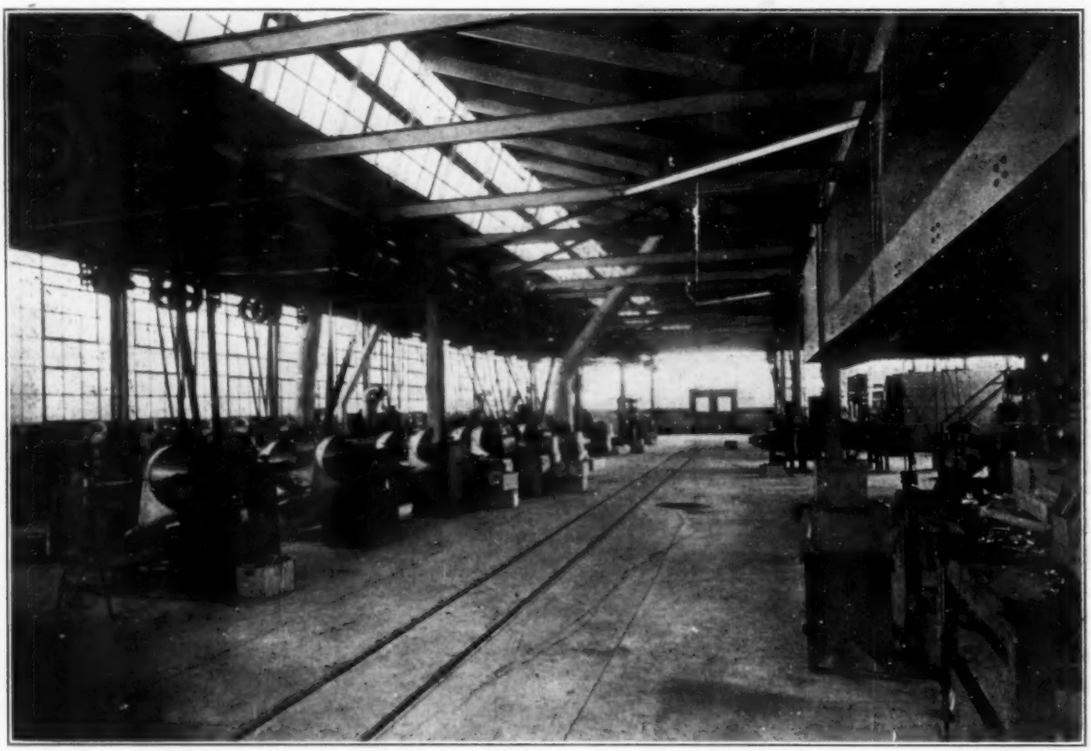

FIG. 5. THE POLISHING AND BUFFING AND NICKEL PLATING DEPARTMENTS.

THE PATTERN SHOP.

There is no department connected with the modern brass shop in which a good system of management, administered by a careful and methodical manner, will be of more benefit to the establishment in general than the pattern shop.

We find it poorly equipped with inadequate and often obsolete machinery, supplied with poor material and lacking many of the essentials for producing good work. Pattern letters and figures should be kept in convenient cases or boxes so as to be securely protected and readily found when wanted. The pattern storage should be so arranged that the groups of shelves or racks are located between the windows. The foreman should have a record of the location of all patterns and plates in the pattern storage loft. The system which will require the least amount of labor and clerical work and the easiest to keep from day to day is the card system.

As the product has now arrived at the first floor from where it started it is now ready for the packers and shipping clerks.

The entire basement of this plant is reserved for manufactured stock and proper bins and racks erected for the reception of the goods so that they are convenient and accessible.

MANUFACTURING EXPENSE.

While the present is by no means the day of small things, but on the contrary the day of very large enter-

prises, it is yet true that the percentage of profits in comparison to the amounts invested and the number of workmen employed are relatively considerably less than formerly. It is therefore necessary to arrange and conduct manufacturing operations in a modern brass manufacturing plant so that every item of unnecessary waste may be eliminated, every ounce of material utilized and every hour of the employee's time expended in useful work and properly accounted for. In laying out and locating the various departments composing the plant you must carefully consider the various operations which will be necessary to its manufacture.

Then you can consider the different classes of machines needed to properly perform these operations. This will give the needed facts in determining th number of departments required and the space they are to occupy will determine the floor space to be occupied by each department.

The character of the work done in each department from the raw material to the finished product will determine the location of the department in relation to each other since the material or stock in progress through the factory should be moved on in one continuous course, with little or no retrograde movement. Every unnecessary movement adds to the expense of manufacturing and also interferes with other stock being moved on its onward way towards completion. This is a point too often lost sight of or its application to existing or future conditions very much underestimated, the result being an unnecesary expense, small, perhaps, but continuous.

GOVERNMENT BRONZE SPECIFICATIONS

STANDARD SPECIFICATIONS FOR COPPER 88, TIN 10 AND ZINC 2, ADOPTED BY AMERICAN SOCIETY FOR TESTING MATERIALS, AT ITS RECENT MEETING AT ATLANTIC CITY, N. J., JUNE 22-26, 1915.

BASIS OF PURCHASE.

1. (*a*) These specifications cover the alloy commercially known as government bronze, admiralty gun-metal, gun-metal, or 88-10-2 mixture, when used in castings.

(*b*) It is recommended that this alloy shall not be used where castings are subjected to a temperature exceeding 260° C. (500° F.).

I. MANUFACTURE .

2. The alloy may be made by any approved method.

II. CHEMICAL PROPERTIES AND TESTS.

3. The alloy shall conform to the following requirements as to chemical composition:

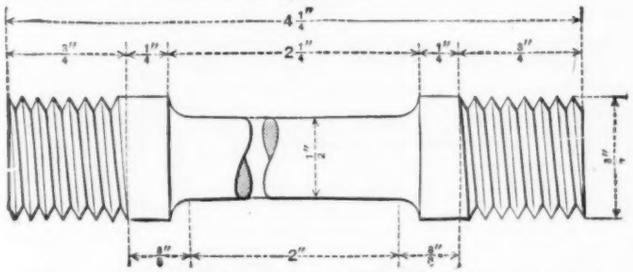

FIG. 1. GOVERNMENT TEST BAR TURNED OFF READY FOR THE TESTING MACHINE.

Copper	87-89 per cent.
Tin	8-11 "
Zinc	1- 3 "

SAMPLING.

4. (*a*) The sample for chemical analysis may be taken either by sawing, drilling or milling the casting or tension test specimen and shall represent the average cross-section of the piece.

(*b*) The saw, drill, cutter or other tool used shall be thoroughly cleaned. No lubricant shall be used in the operation and the saw dust or metal chips shall be carefully treated with a magnet to remove any particles of iron derived from the tools.

III. PHYSICAL PROPERTIES AND TESTS.

TENSION TESTS.

5. The alloy shall conform to the following minimum requirements as to tensile properties:

Tensile strength, lb. per sq. in.	33,000
Elongation in 2 in., per cent.	14

TEST SPECIMENS.

6. (*a*) Two test bars of the form and dimensions shown in Fig. 1 shall be an integral part of large castings, or cast separately in the case of small castings to represent a lot or melt and shall be molded in a manner similar to the castings which they represent. If the castings are heat-treated, the test bars representing such castings shall be similarly heat-treated.

(*b*) The manufacturer and purchaser shall agree whether test bars can be attached to castings, on the location of the bars on the castings, on the castings to which bars are to be attached, and on the method of casting unattached bars. Unless otherwise agreed upon, the minimum lot shall be considered as 500 lb.

(*c*) The tension test specimen, turned down from the test bar shall be of the form and dimensions shown in Fig. 1.

NUMBER OF TESTS.

7. (*a*) Two tension tests shall be made from each lot or melt.

(*b*) If any test specimen shows defective machining or develops flaws, it may be discarded; in which case the manufacturer and the purchaser or his representative shall agree upon the selection of another specimen in its stead.

IV. INVESTIGATION OF CLAIMS.

8. If the purchaser's tests show that the material does not conform to the requirements specified in Section 3, the manufacturer shall have the opportunity to inspect the material and each party shall select a sample for retest. If the results do not agree, each shall select a sample to be sent to a mutually agreeable umpire, whose decision shall be final. The costs of retests shall be paid by the loser.

WHITE COLORS OR COATINGS ON BRASS.

The white color or coating that is given to such brass articles as pins, hooks and eyes, buttons, etc., can be produced by dipping them in a solution that is made up as follows: Dissolve 2 ounces fine-grain silver in nitric acid, then add 1 gallon distilled water and put into a strong solution of sodium chloride. The silver will precipitate in the form of chloride, and this must be washed until all traces of acid are removed. Testing the last rinse water with litmus paper will show when the acid has disappeared. Then mix this chloride of silver with an equal amount of potassium bitartrate (cream of tartar) and add enough water to give it the consistency of cream. The work is then immersed in this and stirred around until properly coated, after which it is rinsed in hot water and dried in sawdust.

THE SUCCESSFUL NICKEL PLATING OF DIE CASTINGS OR ARTICLES MADE FROM SHEET ZINC

By Charles H. Proctor.*

Many platers find it extremely difficult to produce a clear, uniform deposit of nickel upon die castings or articles made from sheet zinc, due to the production of black streaks caused by the formation of zinc sulphide in the deposit. These black streaks are very difficult to overcome in the regular nickel solution, even if the articles are previously plated in cyanide copper or brass solution. It is necessary to use a very high amperage to cover the brass or copper deposit at once in order to avoid the black streaks, and even then when the current is reduced to avoid the burning of the deposit the black streaks will develop.

The author recently visited a plant in a nearby city where the plater is recognized as a very efficient man, and from samples exhibited I can surely vouch for his ability as a first-class workman. But every plater at some time or other finds he is up against a proposition that is somewhat difficult to solve. In this particular instance it was die castings and I know personally that many platers have wished they were dead castings and that they could bury them so deep they would never come to the surface again.

I found on examination that the die castings were only being plated partly successfully. Special solutions were prepared and these were heated. They gave better results than the ordinary solution, as they were made up from the nickel ammonium chlorides instead of the nickel ammonium sulphate solutions, which were found to give excessive trouble. The proposition was put up to the writer for a probable solution of the difficulty. The one given was afterwards found to be very successful, as the castings were plated direct without the production of black streaks and the deposit remained as bright as many of the so-called bright nickel solutions. A good deposit was obtained in five minutes that would withstand the ordinary nickel coloring without cutting through.

The method used was as follows. Proportions of a regular nickel solution were used and consisted of the following:

Water	1 gallon
Double nickel salts	8 ounces
Single nickel salts	2 ounces
Ammonium chloride	2 ounces
Boracic acid	1 ounce

The voltage used was 3½ volts. This solution was giving excellent results on ordinary brass and steel work, but black streaks developed in a few seconds after immersion when deposited on die castings. To the proportions of the above solution four ounces of magnesium sulphate were added to every gallon and in the absence of rolled nickel anodes, which were not obtainable at the time of the test, rolled sheet steel was used in the place of nickel. The die castings were cut down in the regular manner, cleansed and immersed in the solution at three volts' pressure. A variation in the amperage, that is high or low, did not appear to affect the deposit as no sign of a black streak developed. The deposit was clear and uniform and heavy deposits were obtained in a very short time. In one case the articles, which were one-inch elbows, were removed after five minutes and polished in the regular manner and an excellent finish was produced, proving the rapidity of the deposit obtained.

The nickel surface apparently became brighter the longer the articles were plated, but as my time was limited I could not go into the proposition very deeply. The point brought out was that die castings could be plated very satisfactorily in the manner mentioned by the simple addition of magnesium sulphate to ordinary solutions and the use of cold rolled steel as anodes. It may be possible to use rolled nickel anodes in connection with the solution, but if not it may be worth while for some chemist electroplater to define why the use of steel as anodes gives such satisfactory results upon the die castings, which consist mostly of zinc, at least, in the proportion of 90 to 95 per cent., copper, 3 per cent., and aluminum, 2 per cent., without the production of the dreaded black streaks.

Is it due to the positive and magnetic nature of the steel? We know that zinc is very positive, while nickel is less positive than iron and only slightly magnetic. When the same articles were placed in the regular solution after being plated in the special solution they became coated with the black streaks and a darker nickel deposit developed, but when returned to the special solution again they became white and bright. We also know that metallic magnesium is very electro-positive and magnesium sulphate contains the metal in its salt, as magnesium salts, especially the sulphate, is being used with nickel ethel sulphate in the production of bright nickel salts. Is it due to these two combinations that bright nickel is possible? If so, it might be worth while to take the time to determine the true nature of the beneficial influence of magnesium salts upon the reduction of nickel and iron under electrolysis.

The writer is under the impression that an alloy of nickel, cobalt and iron would produce an entirely rust-free coating upon iron and steel and a satisfactory deposit upon zinc. Cobalt is several times more expensive than nickel, but if we could combine it with nickel and iron in a satisfactory alloy it would bring its cost down considerably and eventually as a separate metal and salt in combination it would bring it down to the same cost basis as nickel. It could then be considered as a commercial factor in the plating industry.

Some very satisfactory samples of deposits of cobalt were shown at the recent meeting of the American Electrochemical Society at the University of Pennsylvania, Philadelphia, Pa.

It is no doubt beneficial to coat die casting metal or zinc with a film of brass in a warm brass solution when so desired as a preliminary coating. The following brass solution will give excellent results for the purpose:

Water	1 gallon
Copper cyanide	3 ounces
Zinc	¾ ounce
Sal ammoniac	⅓ ounce
Soda ash, 96%	⅓ ounce

Use the solution warm at 3 to 4 volts' pressure. A brass solution so prepared will give bright and heavy brass deposits upon die castings or sheet zinc in a very short time with excellent results.

*Plating Editor of The Metal Industry.

HEAT TREATMENT OF COPPER AND BRASS*

A Controllable Process in the Preparation of These Metals Which Varies Their Properties and Gives Them a Wide Field of Usefulness.

By Carle R. Hayward.

The mechanical properties of pure metal depend on three factors: First, general qualities inherent in the metal; second, properties imparted by mechanical treatment, such as rolling, drawing or forging; third, properties imparted by heat treatment, that is, heating to various temperatures and cooling at various rates. The first of these three factors admits of no discussion; copper can never be made the same as iron or lead, however it may be treated. The other factors are controllable and are of vital importance, for they may ultimately determine whether a metal is valuable or worthless.

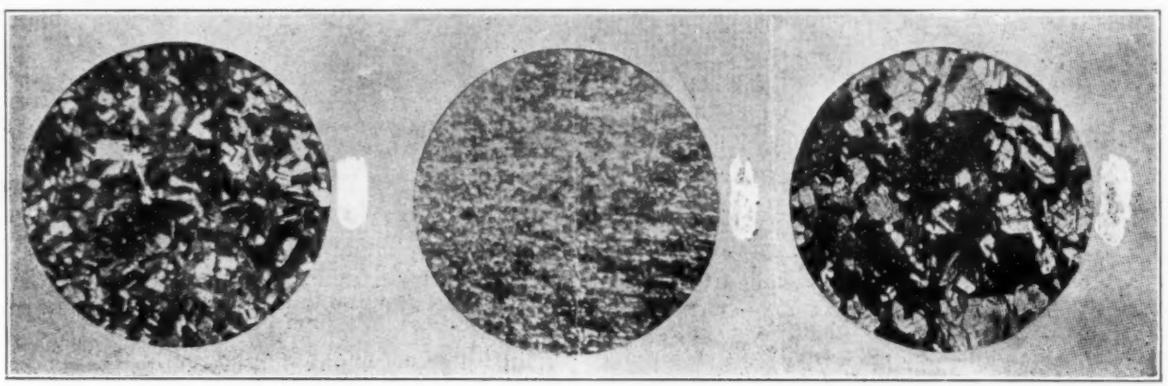

Fig. 1. Annealed Copper.

Fig. 2. Rolled Copper.

Fig. 3. Rolled Copper Annealed at 750 Degs. C. (1,382 Degs. F.).

What has been said above regarding metals is equally true of alloys, the usefulness of which depends not only on the composition but in many cases to a great extent on the mechanical work and heat treatment to which they have been subjected.

It is the purpose of this paper to discuss in a general way the effect of heat treatment on copper and one of its most important alloys, brass.

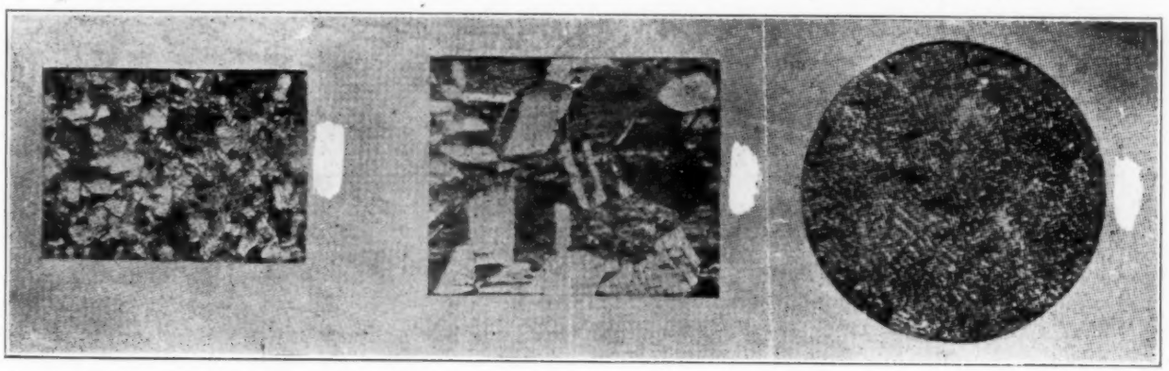

Fig. 4. Rolled Copper Annealed at 650 to 700 Degs. C. (1,200 to 1,290 Degs. F.), for 40 Minutes.

Fig. 5. Rolled Copper Annealed a Short Time at 900 Degs. C. (1,650 Degs. F.).

Fig. 6. Cast Brass.

COPPER.

Copper when cast has the crystalline structure characteristic of all cast metals. The arrangement of the crystals known as casting structure is due to the fact that the metal first solidifies at the outside, and the center is the last portion to become solid. Furthermore, the solidification and subsequent cooling have been so rapid that the crystals are likely to be in a state of strain. This radical arrangement of the crystals and their strained condition make the casting liable to break when subjected to severe stress. When copper castings are heated bright red a rearrangement of the crystals takes place and internal strains are relieved, thus improving the mechanical properties of the metal. By far the larger part of the copper in general use has been subjected to some mechanical work such as forging, rolling into sheets, or drawing into wire. This treatment hardens the metal and greatly changes the internal structure, by crushing and elongating the crystals. Fig. 1 shows a photomicrograph of a piece of soft copper. The structure is developed by dipping in acid. Some crystals are attacked more than others and thus appear dark. After rolling, it had the appearance represented in Fig. 2. Note how the crystals have been distorted and crushed.

For many purposes it is desirable to retain the copper in the hardened state in which it exists after mechanical treatment, but in other cases soft and ductile material is preferred. Fortunately this state can be restored by annealing the metal at a bright red heat (about 700 degs. C. or 1290 degs. F.). This softening is accompanied by a decided change in the structure of the metal as shown in Fig. 3. It will be

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noted that the fractured particles of the original crystals have formed into new crystals and the material presents an appearance similar to the original structure before rolling. The size of the crystals depends on the temperature to which the metal is heated and the time it remains in the furnace. This is well illustrated by Figs. 4 and 5, which show the growth of crystals with temperature.

Quenching copper in water has a softening effect, the cause of which is not fully understood. Unlike steel, copper cannot be hardened or tempered by any method of heat treatment. The so-called lost art of tempering copper is a myth. Analyses of ancient copper implements show that they are in reality alloys of copper with tin, arsenic or some other element which occurred mixed with the copper ore and became alloyed with the metal during the crude smelting operations. These substances have a hardening effect on copper and the hammering process by which the alloy was beaten into the desired form increased this property.

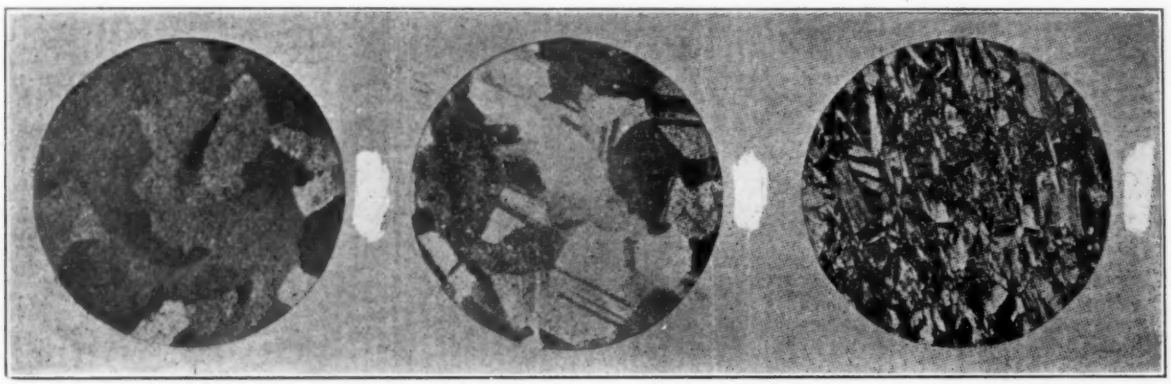


Fig. 7. Cast Brass Annealed. Fig. 8. Annealed Brass. Fig. 9. Brass of Fig. 8 Rolled.

It is seen therefore that the heat treatment of copper is a simple process which consists in heating the metal to a bright red color, thereby removing strains or hardness produced by mechanical work. Temperatures above 800 degs. C. (1470 degs. F.) should be avoided as the crystals become large and the metal is weakened.

The only way copper can be hardened is by alloying it with some other element or by rolling, drawing or forging it.

BRASS.

Brass is an alloy of copper and zinc with sometimes small amounts of other elements to give it special properties. The relative amounts of copper and zinc vary in different brasses but, except for special purposes, the copper is between 55 and 70 per cent., and the zinc varies accordingly. When the copper is above 63 per cent., all the zinc present remains dissolved in the copper, and the solid alloy has a homogeneous structure with the general properties of a pure metal. When, however, the copper is below 63 per cent., the solid metal, when slowly cooled, contains two components, one of which is brittle and makes the alloy undesirable for many purposes.

Much that has been said regarding the heat treatment of copper is equally true of brass. Fig. 6 shows the micro-structure of cast brass and Fig. 7 shows how the crystals have rearranged themselves on annealing. As in the photographs of copper previously discussed, the different shades of crystals are not due to differences in composition but to different degrees of etching. The growth of the crystals takes place in the same way as that of copper crystals. This is illustrated by Figs. 8-16. Fig. 8 shows the structure of a brass with 67 per cent. copper after annealing, and Fig. 9 the structure of the same material after rolling. The effect of temperature on the growth of crystals is shown by Figs. 10 to 12. The effect of time on the growth of crystals at constant temperature is illustrated by Figs. 13-16.

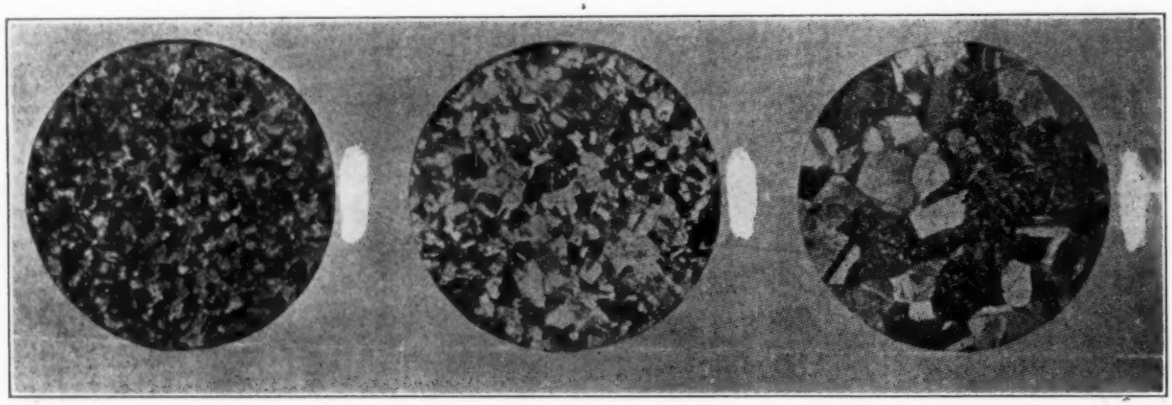


Fig. 10. Brass of Fig. 9 Annealed 50 Min. at 425 Degs. C (797 Degs. F.). Fig. 11. Brass of Fig. 9 Annealed 50 Min. at 500 Degs. C. (930 Degs. F.) Fig. 12. Brass of Fig. 9 Annealed 50 Min. at 600 Degs. C (1,110 Degs. F.).

Brass is hardened by rolling or drawing and softened by annealing. Spring brass is given its properties by rolling and would lose them by annealing. The rearrangement of crystals in rolled brass begins at 420 degs. C. (788 degs. F.), which is below the faintest

red heat. Between 600 degs. and 700 degs. C. (1,110 degs. and 1,290 degs. F.) all internal strains and hardness are removed.

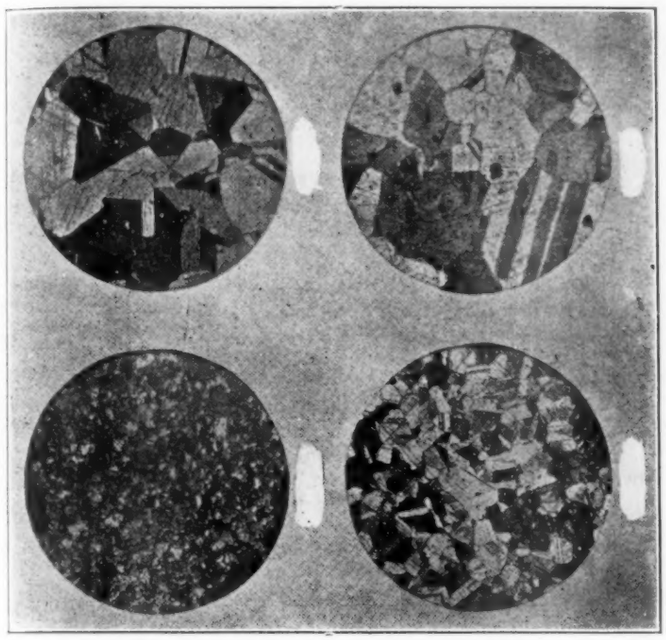


Fig. 13. Rolled Brass Annealed at 650 Degs. C. (1,200 Degs. F.) for 15 Seconds.
Fig. 14. Rolled Brass Annealed at 650 Degs. C. (1,200 Degs. F.) for 40 Seconds.
Fig. 15. Rolled Brass Annealed at 650 Degs. C. (1,200 Degs. F.) for 2 Minutes.
Fig. 16. Rolled Brass Annealed at 650 Degs. C. (1,200 Degs. F.) for 15 Minutes.

Care must be exercised when heating brass, not to allow the temperature to exceed 800 degs. C. (1,470 degs. F.), as there will be danger of volatilizing some of the zinc contained in it, leaving the alloy porous.

The quenching of brass containing more than 70 per cent. copper makes little difference in its mechanical properties. With smaller amounts of copper, especially between 50 and 63 per cent., the slowly cooled metal is more brittle than the chilled material. This is due to the fact that chilling prevents the separation of a brittle compound of zinc and copper.

The above facts about copper and brass show that the heat-treatment of these materials is a simple matter compared with the treatment of steel, where slight differences in the temperature, time of heating, and rate of cooling may produce widely divergent results. If the steel has been overheated but not "burnt" the coarse structure obtained can be removed by reheating to a lower temperature. In the case of copper and brass, heat-treatment is merely annealing and the rate of cooling, except with brasses containing less than 65 per cent. copper, is of comparatively slight importance. If the structure is coarse, due to heating too long or at too high a temperature, the metal cannot be refined by reheating, but must be subjected to rolling, hammering, or drawing, which will break up the crystals. Reheating to the proper temperature will then soften the metal and relieve the strains.

In general it is true that fine-grained material is mechanically superior to that with coarse grains. For this reason care should be taken to anneal copper and brass at the lowest temperature which will relieve the strains due to mechanical work. Higher temperatures will produce larger crystals. The proper temperature varies somewhat with brasses of different composition, but, except in special instances, for either brass or copper, should not exceed the temperature given above (700 degs. C.), and in most cases a lower temperature (600-650 degs. C.) is preferable.

When it is desired to remove only part of the hardness, the copper or brass may be annealed at a dull red heat for a short time, and even heating to a temperature just below dull red will sometimes suffice.

DETERMINING WEIGHT OF DEPOSIT*

SOME VALUABLE SUGGESTIONS FOR THE CHEMICAL DETERMINATION OF ELECTROLYTICALLY DEPOSITED METAL.

BY L. C. WILSON.

(Continued from April.)

So much for the methods of estimating copper. As regards any choice between the two which have been given, that is largely a personal matter. In careful hands either one will give perfectly reliable results, which is all that can be asked of any process; no method is fool-proof. The iodide method takes less time, after the solutions are once made and standardized. On the other hand, in the electrolytic method, the operator may start it going and leave it to run all night, or during the day, while he is otherwise employed. Probably in the last analysis, the selection should be made considering the number of analyses to be run and the facilities available.

Turning now to the study of copper coatings, we recall that in our discussion of nickel deposits, in the previous article, it was noted that these are very seldom of uniform weight over the entire surface of the plated part. Due to certain almost unavoidable conditions in the plating process itself, some surfaces of a part receive a heavier deposit than others. Generally, no attempt is made to improve this condition, although in some cases curved anodes, which follow roughly the shape of the parts, may be resorted to in order to obtain a satisfactory coating. Now, all plated deposits are subject to this same fault, and copper is no exception.

In determining, therefore, the areas of light and heavy deposit on the surface of a part, the same procedure as given before, may be employed. This consists in covering the article completely with beeswax, then removing this in narrow strips extending clear around the part or in any desired direction, then immersing in dilute nitric acid, say 1 part strong acid in two or three parts distilled water, in a beaker. In this instance it will not be as easy to determine when the copper is all removed and the base metal exposed, as in the case of nickel, but by close watching, frequently removing the object from the solution, no trouble should be experienced in getting results sufficiently close for the purposes at hand. As the different areas are exposed in succession, they may be marked in some way and at the conclusion of the test a good deal of valuable data regarding the relative thickness of the deposit at various spots will be had. When the general distribution of copper over the surface of the parts has been pretty thoroughly worked out, the wax may be removed from any desired spot,

*Descriptions and illustrations of the apparatus needed to carry out the analysis described in this article are contained in an article by the same author, published in May, August and December, 1914.

leaving a space of some definite area, the copper determined and the weight per square inch calculated. The same precautions should be taken as were given in the case of nickel, that is, care must be exercised not to scrape away any of the copper deposit, while removing the wax. A rag wet with chloroform and placed on a stick will remove the last traces of wax and leave a clean surface for the acid to attack. Before immersing the part in the fresh acid, it is a good idea to refill all of the exploration strips and avoid loading up the solution with a lot of metal. Iron parts should be stripped in concentrated nitric acid; the dilute acid may be used for brass and other parts.

When the copper is entirely removed from the area under test, the part is taken out and rinsed off with distilled water from the wash bottle. The solution may contain, in addition to the copper, iron, zinc, lead, tin or perhaps other metals. All of these come, of course, from the acid attackng the part itself. The next step will depend on the method chosen for the determination. If it is decided to employ the iodide method, the solution should be evaporated down to a bulk of about 50 c.c. A little bromine water may then be added, to assist in expelling the red fumes, and the solution boiled a few minutes. Strong ammonia is now poured in until the liquid has quite a distinct smell of it. The copper will be thrown out and then re-dissolve to a deep blue solution; while the iron will come down in a brownish red precipitate. The solution is allowed to cool and settle and is filtered.

The ferric hydroxide, which remains on the filter, is washed several times with a jet of hot water from the wash bottle, to remove all traces of copper. The filtrate, or copper solution is then boiled until the excess of ammonia is expelled; which is shown by the odor becoming faint or by a change of color. Strong acetic acid should now be added, in slight excess. If any copper oxide or hydroxide has precipitated, it should be made to dissolve, boiling again, if necessary. Cool to room temperature, add an excess of potassium iodide and titrate at once with the thiosulphate solution, as directed previously.

It may be noted here, a slight excess of potassium iodide gives the best results. As the salt is quite expensive, however, it is desirable to avoid too great an excess. Therefore, a fair amount, say ¾ gram, should be used, and a little more added after the titration is apparently finished. If the blue color is immediately restored, a little more iodide should be added and the titration with thiosulphate resumed.

The burette reading should now be taken, then by multiplying this by the value of 1 cubic centimeter of the solution in terms of copper, we have the actual weight of this in grams. Dividing it by the area of the stripped spot, and moving the decimal point three places to the right, we get the result as milligrams of copper per square inch.

An example will make this clearer. Suppose 3.6 c.c. of thiosulphate solution were required, each cubic centimeter of which is equivalent to .0055 grams copper. Then 3.6 x .0055 = .0198 grams copper. If the area of the surface under test was 1.32 square inches, .0198 ÷ 1.32 = .015, then moving the decimal point three places to the right, we get 15.0, which is the number of milligrams of copper per square inch.

If the electrolytic method is preferred, the solution may often be electrolyzed directly, as it may not contain enough impurities to affect the determination seriously.

When the part under examination is made of iron and concentrated nitric acid is used to strip off the copper, ordinarily very little iron gets in solution, since the acid renders it "passive" or insoluble. As there are no other metals present, the solution may be adjusted to the proper volume and acidity and the analysis completed. If the acid becomes hot during the stripping, however, a good deal of iron may go into solution and in that case it may be evaporated down to about 50 c.c., and the iron removed by adding a slight excess of ammonia, allowing to cool and settle, then filtering off the precipitated ferric hydroxide and working thoroughly with hot water as in the case of the iodide method. The filtrate may then be prepared for electrolysis, as directed below.

If there is any doubt as to the amount of iron in solution, ammonia may be added to the hot solution as above and the precipitate allowed to settle. If it is of comparatively small bulk, it may be disregarded and the solution prepared for the completion of the determination. If there appears to be much iron present, however, it will probably be safer to filter it off as before.

For the electrolysis the solution should have a volume or from 100 to 120 c.c. and contain an excess of two per cent to three per cent strong nitric acid; therefore it will be advisable to add ammonia or nitric acid, depending on whether it is acid or alkaline in reaction, until the solution is neutral to litmus paper; this latter, which is obtained from the supply houses, is colored red by acids and blue by alkalis; therefore, a neutral solution produces no color change in either the red or blue paper. Two or three cubic centimeters of strong nitric acid will now give the proper reaction.

The cone or screen and spiral should be cleaned and the former weighed as described before, then immersed in the solution and the electrolysis carried on as previously. After determining the increase in weight of the screen, the calculation is made exactly as in the iodide method; that is, the weight of copper is divided by the area of the stripped surface and the result is pointed off.

It is obvious that it is a difficult matter to determine the weight of copper on a part made of brass or any other alloy containing copper, for the simple reason that the acid attacks the part itself when the copper deposit is removed, and thus adds more of the metal of the solution. By very careful manipulation, it is possible to get fairly approximate results, but if close figures are demanded, the best way to do is plate the part heavily with nickel, then put on the copper in the regular way and proceed with the examination as before. The copper is easily attacked by the dilute acid, while the nickel is not, consequently the metal of the part itself is protected, for a time at least. Ordinarily, however, brass parts are not copper plated, except for the production of oxidized finishes; in that case a very light deposit is used, which is hardly worth bothering with.

Iron and steel parts, on the other hand, generally receive heavy deposits, to protect them from corrosion, consequently they will be most often examined. As noted above, if concentrated acid is used, very little iron is dissolved.

Regarding the proper weight of deposit to be applied, this would vary considerably, according to conditions. In the case of some iron or steel parts, not exposed to wear or severe climatic conditions, a deposit of medium weight, say, not less than 10 or 15 milligrams per square inch would probably be sufficient. Of course, the deposit on certain surfaces might be much higher than this. Other parts subject to harder service, would likely require a considerably heavier deposit, perhaps up to 50 milligrams, or even more.

(To be continued.)

POLISHING WHEELS

AN ARTICLE, DESCRIBING THE VARIOUS VARIETIES OF WHEELS USED IN METAL FINISHING, IN THREE PARTS.

PART III.

BY WALTER C. GOLD.*

(Concluded from April.)

CIRCULAR SCRATCH AND SATIN FINISH WHEEL BRUSHES.

These types of wheel brushes are being used to a large and increasing extent. The construction of these brushes must be a matter of interest to the user and it is briefly described as follows: Both dogwood and maple are used for the brush blocks, the former in the smaller brushes and the latter for the larger and heavier-sized wheels. It is impossible to secure dogwood in larger diameter than three inches owing to the nature and growth of the tree.

In drilling the holes some manufacturers use a taper drill, the holes thus being drilled in one operation. A better, but more expensive way, is to use two sizes of drills, the larger drilling part way through the block and the smaller finishing through. The smaller hole only allows the drawing wire to pass through to center of block, whereas the larger holes contain the tufts of wire. By thus drilling with two different sizes of drills, there is formed a "stop" or "shoulder," or we might better term it a square "seat" which prevents the wire from backing out into the center of the hub. With the wire tufts thus set, they better take the pressure off the work. In setting in the wire, it is doubled up and the tufts are then set into each hole where they are securely fastened with the drawing wire. This is done by hand with brass wire. After all the tufts are set, the brush is placed upon a wheel trimmer. Lead is then poured into the block on both sides, thus making the sides of the wheel perfectly flat and enabling the operator to screw the brush on a taper spindle. The thickness of the lead center varies with the size of the arbor hole and the construction of the hub. The use of lead is a forward step, giving much better satisfaction than the rosin previously used.

MATTING BRUSH.

JEWELERS' SCRATCH BRUSH.

GAUGES OF WIRE USED.

The ordinary diameters of scratch brush wheels vary from 2½ inches to 8 inches and the number of rows from one to four, although five to six rows are frequently called for. The length of wire or "cut of stock" ranges from ¾ to 2 inches. The sizes of wire generally used are from .0025 to .0075 diameter. For ordinary work .004½ to .005 is the gauge used. A matting brush will run from .003 to .005, thus taking finer wires than the regular scratch or a "satin finish" brush. The "satin-finish" wheel requires sizes .005 to .006 and the jewelers' scratch brush from .003 to .005. The gauge of wire is an important factor in the economical use of these wheels; if the proper size and quality of wire is used and at correct speed the wire will not snap off, break or mat down. Hence, on first orders the manufacturers desire a worn down satisfactory wheel in order to note its construction throughout, and to especially note and measure the gauge of the wire.

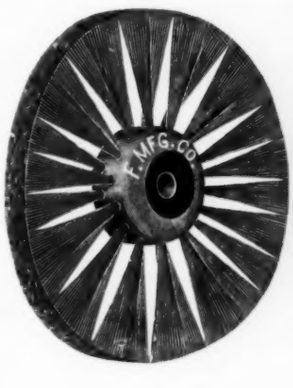
*Of Walter C. Gold, Philadelphia, Pa.

SPEEDS OF SCRATCH BRUSH WHEELS.

No fast or set rule can be followed in the matter of speed as this will vary, and accord with the diameter of the wheel and with the article to be scratched; the experience of the operator and the style of finish desired. Generally speaking, however, the speed should be slow for a hard metal and faster for a soft metal.

THE USE OF LIQUIDS.

There is quite a diversity of opinion as to the best sort of liquid to use in conjunction with scratch brushing. Stale beer has been used to a large extent, but other liquids are rapidly taking its place, especially in States where prohibition is extant. Some operators use glue-water. Others are taking up the application of soap-bark water, it being made by taking an ordinary salt bag, putting in the soap bark and then suspending the bag in a bucket fitted with a faucet. Whether work should be scratch brushed wet or dry depends entirely upon the nature of the work. Plated work should always be brushed wet. As a rule, brass wire wheels are run wet, for brass plated work, copper plated work and silver plated work. They are run dry for oxidized and gun metal finishes.



SATIN FINISH BRUSH.

SILVERSMITHS' AND PLATERS' SCRATCH BRUSH.

IMPROVEMENT IN MANUFACTURE.

There has been a great improvement in the manufacture of scratch brush wheels in the last quarter century. The quality and uniformity of the wire and the method of construction are of a higher standard. The consequence is that complaints are very few and if the wheels are

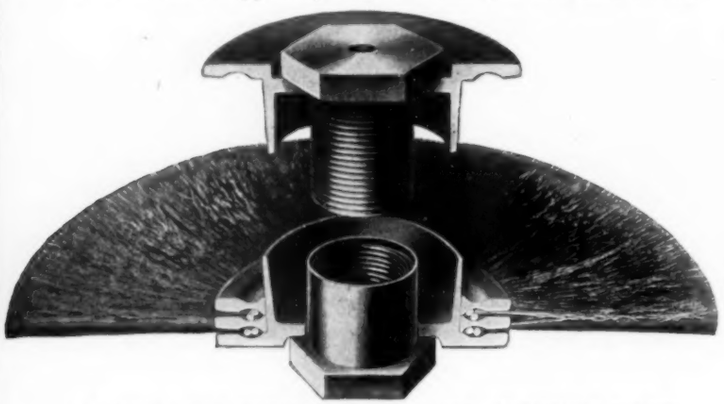
properly used there should be practically none. For instance, the brushes should not be allowed to dry out (if used wet) as the blocks will almost certainly crack and warp owing to the swelling and contracting of the wood. The brushes should be constantly kept in water, if used wet. Care should also be exercised in putting them on the spindle and making sure that they run true at all times. There should also be a supply of different types of wheels as no one type should be expected to do too great a variety of work.

THE "ECONOMY" WIRE BRUSH WHEEL.

In 1897 there was placed upon the market a wheel for the finishing of metals, which is having, and is destined to attain in much greater degree, a large influence. Well may it be termed "Economy" as it has markedly justified its name! It was invented by Mr. Henry Neilson, the United States patent number being 822,757. There are about 20,000 wheels being run at the present time throughout this country.

METHOD OF CONSTRUCTION.

The "Economy" wheel consists of steel or brass wire disc sections slipped upon a steel hub (as indicated in the



SHOWING THE CONSTRUCTION OF THE "ECONOMY" WHEEL.

above cut), which is screwed up tight. The sections are separated from each other by grooved steel rings which fit over the inner edges and hold them firmly in place. At first, it was a difficult matter to insert new sections of fillers in the hubs, but in 1906 the "Improved Economy" wheel came out, enabling the operator to expeditiously make the change of fillers. A recent and very valuable improvement is the welding of the ends of the section stem wires. The gauges of steel wire (Washburn & Moen Gauge) are as follows:

Diameter of Brush	Section Number	Gauge of Wire
15 inches	3314	No. 33
12 "	3411	" 34
10 "	358	" 35
8 "	364	" 36
7 "	373	" 37
6 "	S510	" .0075

For special purposes the smaller diameters are made from wire as fine as .003.

USE OF "ECONOMY" WHEELS.

The field of use is very wide. They are especially adapted for cleaning castings and patterns; for removing scales from hot forgings; for cleaning sheet brass, sheet copper and sheet aluminum before painting; for cleaning articles which are to be nickel plated or galvanized, etc. They are also manufactured with concave face for cleaning brass and copper tubes. Some special purposes for which these wheels are used follow:

IN SHOVEL FACTORIES.

For cleaning scale from hot shovel blades after they have been forged and prior to the "forming" operation, wheels 12 inches wide are usually used. In some plants Economy wheels are used for satin finishing the blades.

AUTOMOBILE BODY PLANTS.

For cleaning and roughing aluminum sheets before painting and finishing, wide faced wheels are used for this work, running in width from 24 to 42 inches.

GALVANIZING PLANTS.

For cleaning and scouring sheets prior to galvanizing, a special machine is usually built for this purpose. With such a machine one man working one hour can scour and clean as many sheets as ten men working all day without it.

USE OF "ECONOMY" WHEELS IN STOVE FOUNDRIES.

"Economy" wheels are usually used in the plating departments of stove foundries for thoroughly cleaning sand and other matter from castings before nickel plating; also for

THE COMPLETE "ECONOMY" WHEEL.

cleaning the scroll work pieces which cannot be cleaned in the tumbling mill.

BEDSTEAD MAKERS.

"Economy" wheels are used by brass bedstead makers in connection with cotton buffs for producing satin finish. Some manufacturers use other means for this work, but Economy wheels seem to give the best finish.

SPEED.

As with all grinding and polishing wheels, speed is an important factor in the use of "Economy" wheels. After long experiments we find that the best speeds are as follows:

15 inches	diameter	.....	1,200 to 1,600 r. p. m.
12 "	"	.....	1,500 " 1,800 "
10 "	"	.....	1,800 " 2,100 "
8 "	"	.....	2,100 " 2,400 "
7 "	"	.....	2,400 " 2,600 "
6 "	"	.....	2,600 " 2,800 "

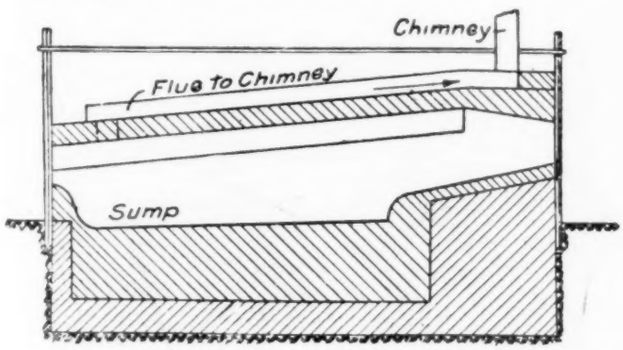
Most operators of wire wheels run them too fast. For instance, I recommend a speed of 1,200 to 1,600 r. p. m. for the 15 inches diameter. Should this size be operated at 2,100 to 2,400 r. p. m. the wire will crystallize and break off. The crystallization of the wire is caused by vibration. Too much pressure should not be applied to the wheel; the pressure should be moderate in order to attain the best results. If run at proper speed the wire will stand out stiff and present a sharp scratching surface. The brass wire sections are used for brass, bronze and copper work where steel wire, if used, would discolor the work.

THE REFINING OF ZINC WASTE

SOME POPULAR INFORMATION REGARDING THE WORKING OVER OF THIS NOW HIGH-PRICED METAL.

BY L. J. KROM.

Judging from the number of inquiries coming to the office of THE METAL INDUSTRY, it would seem that a few remarks relating to the metal zinc would be welcome at this time. Of course, the high price of spelter or cast zinc and zinc in its various manufactured forms is the direct reason for the sudden interest being taken in the metal. As is well known, the enormous orders for brass and cartridge brass particularly, into which zinc enters as a most important component part, are the cause of the heavy demand for high class zinc. That the prices of the grades of zinc used for purposes other than brass, such as galvanizing, etc., have risen is due partly to demand and partly to a disposition on the part of producers to boost the price, and have done so, but probably will have a set-back, for consumers have been driven to discover other materials and may not be so ready to go back to zinc. As zinc that is to be manufactured must be pure before it can be rolled, drawn, spun or otherwise worked, there is good reason for the higher prices now prevailing for this material; it can be used for cartridge brass because of its inherent purity.



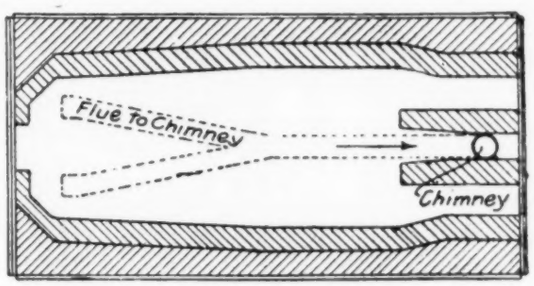


FIG. 1. SECTION PLANS OF A ZINC REFINING FURNACE TO HOLD 20,000 POUNDS.

SOME CHARACTERISTICS OF ZINC.*

"Zinc is a white metal with a bluish gray tint and is commercially known as 'Spelter.' The fresh fracture of a cake of commercial zinc (spelter) presents large and very brilliant cleavage planes, especially when the metal is free from iron. The fracture is more largely crystalline the higher the temperature of casting is above the melting point of the metal. It is a comparatively soft metal, but is harder than tin. At ordinary temperatures it is brittle, but between 100 degs. C. (212 degs. F.) and 150 degs. C. (302 degs. F.) it is sufficiently malleable to admit of being rolled into thin sheets and drawn into wire. The melting point of zinc is 415 degs. C. (779 degs. F.) and can be readily distilled at a bright red heat. Its boiling point is about 940 degs. C. (1,724 degs. F.), but it will burn in the air at as low a temperature as 500 degs. C. (932 degs. F.). When in a molten condition zinc is readily oxidized and at its boiling point it burns, zinc oxide being produced."

VARIOUS GRADES OF "SPELTER."

As regards the grades of spelter in use at the present time, the classification as adopted by the American Society for Testing Materials in 1911 was published in THE METAL INDUSTRY for April, 1915, and it might be well to repeat them here in order to give a clear understanding to this article. They are as follows:

STANDARD SPECIFICATIONS FOR CAST ZINC.

1. Under these specifications Virgin Spelter, that is, spelter made from ore or similar raw material by a process of reduction and distillation and not produced from re-worked metal, is considered in four grades, as follows:

A.....	High Grade.
B.....	Intermediate.
C.....	Brass Special.
D.....	Prime Western.

2. A brand shall be cast in each slab by which the maker and grade can be identified.

3. The maker shall use care to have each carload of as uniform quality as possible.

4. A. High Grade.—The spelter shall not contain over

0.07 per cent. lead.
0.03 " " iron.
0.05 " " cadmium.

It shall be free from aluminum.

The sum of the lead, iron and cadmium shall not exceed 0.10 per cent.

B.—Intermediate.—The spelter shall not contain over

0.20 per cent. lead.
0.03 " " iron.
0.50 " " cadmium.

It shall be free from aluminum.

The sum of the lead, iron and cadmium shall not exceed 0.50 per cent.

C. Brass Special.—The spelter shall not contain over

0.75 per cent. lead.
0.04 " " iron.
0.75 " " cadmium.

It shall be free from aluminum.

The sum of the lead, iron and cadmium shall not exceed 1.20 per cent.

D. Prime Western.—The spelter shall not contain over

1.50 per cent. lead.
0.08 " " iron.

This classification corresponds substantially to the understanding among zinc smelters. Of the four grades mentioned above A is usually used for brass of high ductility and malleability such as wire and cartridge cases, although C is used by some mills.

METHODS OF ZINC REFINING.

One of the questions most often asked nowadays is, How can we remelt our scrap zinc and make it good? Or how can we remelt low grade spelter to make it high grade? It is not the purpose of this article to go into the manufacture of spelter from the ore. This is a smelting proposition requiring an expensive instal-

* "Metallurgy of Non-Ferrous Metals," Gowland.

lation as regards furnace and by-product plant for the recovery of all of the elements of the ore. There are three separate and distinct processes whereby zinc, in the form of scrap or ingot metal, may be refined. These are

1. Distillation from closed retorts.
2. Liquation.
3. Electrolytic deposition.

It will be seen then that none of these processes include the simple remelting of scrap zinc. So to answer the first question given above I will have to say that scrap zinc cannot be refined by a simple remelting in either an iron pot or in a crucible. Some of it may be recovered, but there will be a residual product containing the most common impurities, zinc oxide, iron and lead. The same answer can be given to the second question. One of the ways that either scrap zinc or a low grade spelter can be refined is by distilling it in a retort furnace such as is used in the original smelting operation to produce spelter from the ore, using a filter device to catch the lead. This device, I believe, is patented, but is used on a royalty basis. A description of this process was published in THE METAL INDUSTRY for August, 1912. Where zinc is melted and kept molten in large quantities for any

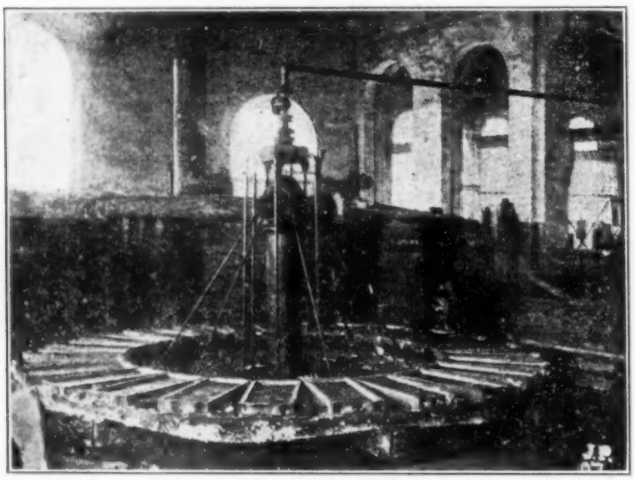


FIG. 2. ZINC CASTING TABLE AND REFINING FURNACE.

length of time as in galvanizing a certain amount of oxide is formed. This oxide is skimmed off the top with a perforated ladle and together with some small shot of zinc constitutes galvanizers' waste. In course of time there also settles at the bottom of the tank a hard mass consisting of zinc and iron which cannot be separated by simple melting; this material must be subjected to the distillation process or sold for sterro metal. The zinc skimmings are usually sold to the refiner and are mixed with ore and thus reduced to pure zinc by distillation. The low grade zinc mentioned above may be purified, but not to high grade, by means of liquation.

THE LIQUATION PROCESS.

When zinc is kept molten for some time as near its melting point as possible the impurities, iron and lead, will settle out. At this temperature zinc will only retain about from 1.0 per cent. to 1.1 per cent. of lead in solution, the excess settling to the bottom. The iron also settles as a zinc-iron alloy, forming a layer above the lead. The operation of liquating is carried on in a reverberatory furnace. A typical form is shown in Fig. 1. This furnace will take a charge of ten tons. The hearth, which is of fire clay firmly beaten down, measures about 13 feet by 6 feet and slopes downward from the fire bridge to the ladling door. Within the ladling door a cast iron plate, projecting down from the roof and dipping into the zinc, is sometimes fitted, to prevent air from passing into the interior of the furnace and oxidizing the metal. For the same reason the flame from the fire place must be as reducing as possible. The crude zinc is charged in through a door near the fire bridge and melted down very slowly, the fire being kept low and the flame reducing. If the temperature is too high, the zinc will retain much lead, as the solubility of lead in zinc increases with the temperature. At 650 degs. C. (1,000 degs. F.) it will dissolve from 5 to 6 per cent.

When the charge is molten, which requires about two days, the scum which has formed on the surface is removed with perforated ladles or is skimmed off and about one-third of the zinc in the furnace is ladled out, at the lowest possible temperature, into iron molds in which it is cast either into cakes for sale or slabs for rolling. The molds in the best works are set on a rotating table in front of the ladling door; see Fig. 2. An equal quantity of crude zinc is then charged into the furnace, and when molten and settled, the ladling is repeated. The lead which separates and collects at the bottom of the furnace contains about 6 per cent. of zinc. The iron in the form of a zinc-iron alloy

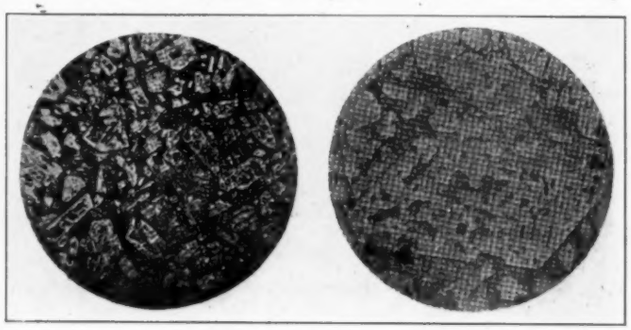


FIG. 3. HARD ZINC, CONTAINING 10 PER CENT. OF IRON (30 DIAMETERS).

FIG. 4. HARD ZINC (120 DIAMETERS).

also settles down and floats on the lead as a pasty mass of so-called "hard" zinc, containing 15 to 20 per cent. of iron. The lead bottoms are allowed to accumulate for from 6 to 8 days before they are removed and can be used in the Parkes process for desilverizing lead or the lead is refined by burning off the zinc. The "hard" zinc as in the case of galvanizing "hard zinc" can be distilled or sold for the manufacture of sterro-metal.

THE ELECTROLYTIC SEPARATION.

The third method for refining zinc is by electrolytic deposition, but although attempts have been made for thirty years, no economic success has been attained as far as ordinary spelter is concerned, although specially pure metal, which commands a higher price for the manufacture of brass for cartridge cases and other articles requiring a highly ductile alloy, is now made on a commercial scale. The high cost of electric power has operated against all the processes, while in many the chief difficulties have arisen through the deposition of the metal in the form of zinc sponge mixed with zinc oxide, which cannot be melted, as it ignites when heated. A description of one of these processes, said to be the most successful so far, is that devised by Hüpfner, which is described in "The Metallurgy of

the Non-Ferrous Metals" by Prof. W. Gowland.

Another method of refining which is coming into use is the electrical. The chief drawbacks which have prevented the commercial success of the application of the electric furnace to the refining of zinc in the past has been the cost of the current and electrodes, the loss of metal and the formation of a large amount of zinc oxide which has to be re-treated. However, I believe that the electrical process is now being operated successfully. A description of one of these, the Johnson process, was described in THE METAL INDUSTRY for June, 1912.

So it will be seen that there is not much hope of a simple and inexpensive process whereby scrap zinc, galvanizers' waste and other zinc products can be worked over and brought up to a high grade. Of the processes mentioned above the electrolytic, however, offers perhaps the best solution of the problem, but not for the small consumer; for him the scrap metal smeltery is the best refuge.

FATIGUE OF COPPER ALLOYS*

A REPORT OF SOME EXPERIMENTS INSTIGATED BY THE FAILURE OF SOME MATERIAL USED IN THE CATSKILL WATER SUPPLY FOR THE CITY OF NEW YORK.†

BY ERNST JONSON.‡

In previous papers[1] the writer has pointed out that the occurrence of so-called season cracking in brass rods is conditioned by (1) high initial tensile stress in the surface of the rod, and (2) by corrosion of the metal; also, that a brass rod may develop cracks of the same nature as season cracks when stressed beyond the initial yield point by an external load, instead of having initial stress set up by the cold drawing of the rod, and that such cracking is not peculiar to one kind of brass but that all kinds of forgible brass are subject to it.

At the time of the previous writing, the following brasses were tested and cracked when etched with ammonia, while under stress greater than the initial yield point: Cast manganese bronze from two foundries, plain-extruded manganese bronze, rolled-and-drawn manganese bronze, plain-extruded naval brass, drawn naval brass, and plain-extruded Muntz metal. No cracking has been observed where high stress and corrosion did not co-exist. From these facts the conclusion was drawn that the ordinary ultimate strength of brass is developed only when the metal is broken so quickly that cracks do not have time to develop, and that when a stress exceeding the yield point is applied for a considerable time the metal will fail by cracking.

The working hypothesis formed for the purpose of co-ordinating these facts and to guide further investigations is as follows:

In copper alloys there are microscopic flaws. When the tensile stress approaches the yield point these flaws are opened sufficiently to admit corrosion. This corrosion weakens the edges of the flaws and causes them to increase under the continued action of the stress, and thus a continuous crack is formed which gradually increases in depth. When the crack has so reduced the cross-section that the stress on the remaining solid portion exceeds the ultimate strength, the rod breaks.

In order to more definitely determine the magnitude of the stress at which cracking begins another series of tests has been started. Each test was made as follows: A tension test specimen of 1 in. diameter and 8 in. length, with a reduced diameter of 0.8 in. and 6-in. gage length, was placed in the testing machine. A sheet steel cup with a 1-in. hole in its bottom was put on top of the lower grip so that the end of the test specimen passed through it, and the cup was filled with strong ammonia. Some absorbent cotton was tied to the test specimen so as to keep it wet by capillarity, and the cup and test specimen were covered by a conical paper hood so as to confine the ammonia fumes. A stress of 10,000 to 17,000 lb. per sq. in., increased by increments of about 3,000 lb. per sq. in. at intervals of a day or more, was applied to the test specimen. Under the higher stresses the test specimen continued to stretch for a considerable length of time, and in such cases this time was added to the interval between the additions of load.

The test specimen was examined before each increment of load was applied. When the first crack was seen the test was concluded, because experience has shown that a crack once started will increase in extent until the test specimen fails, even if the load is not increased. The cracks were similar to season cracks; the largest was generally found where the test specimen emerged from the liquid. In some cases this crack was the only one present; in others there were quite a number of cracks distributed over the length of the test specimen.

In order to discover what alloys are subject to failure by cracking all the usual copper alloys will be tested.

The stresses at cracking are as follows:

Kind of Metal.	Stress at Cracking, Lb. Per Sq. In.
No. 1.—Manganese bronze, plain extruded	27,000
No. 2.—Manganese bronze, plain extruded	23,000
No. 3.—Manganese bronze, plain extruded	23,000
No. 4.—Naval brass, plain extruded	20,000
No. 5.—Muntz metal, plain extruded	23,000
No. 6.—Gun metal, cast 88 Cu, 10 Sn, 2 Zn	23,000

It appears that the stress at which cracking occurs bears some relation to the elastic limit, but this relation has not yet been definitely established. Present results indicate that the metal is liable to cracking when the stress exceeds the elastic limit by 5,000 lb. per sq. in.

Four specimens of manganese bronze have been under excessive stress for many months but have been protected from corrosion. These specimens have not cracked. Some manganese-bronze studs which were found cracked in valves in the Catskill Aqueduct were made up with red lead. One test bolt, therefore, was embedded in red-lead paste and drawn up to a stress in excess of the initial yield point. In the part of the bolt where the red lead remained liquid, the surface of the metal was stained and cracks appeared.

Two specimens of plain-extruded manganese bronze were corroded, one in ammonia, the other in a mixture of ferric chloride and hydrochloric acid, and then broken in the testing machine. The specimens gave ultimate strengths of 65,300 and 60,000 lb. per sq. in., and elonga-

* Paper read at Atlantic City meeting American Society for Testing Materials, June 22-26, 1915.

† A description of these failures was published in "The Metal Industry," December, 1914. Brass in Engineering Construction by Alfred D. Flinn.

‡ Engineer of Tests, New York Board of Water Supply.

[1] "Cracking of Drawn Brass," Engineering Record, April 11, 1914; "Troubles Experienced with Forgible Brass during the Construction of the Catskill Aqueduct," Proceedings, Am. Inst. Metals (1914).

tions of 43 and 42 per cent., respectively. These results, which are quite normal, indicate that corrosion does not generally injure brass when it is not under stress while being corroded.

The results thus far obtained may be summed up as follows:

1. Prolonged excessive stress does not injure the metal when it is protected from corrosion while under stress.

2. Corrosion does not generally injure the metal when not accompanied by excessive stress.

3. Corrosion accompanied by prolonged stress less than 20,000 lb. per sq. in. does not generally injure the metal.

4. Corrosion by ammonia accompanied by a prolonged stress of 20,000 lb. per sq. in. or more causes cracking similar to season cracking.

5. The foregoing results apply to manganese bronze, naval brass, Muntz metal and gun metal.

6. No copper alloy has as yet been found to which these results do not apply. It is possible, however, that such exceptions exist, either on account of higher elastic limit or greater resistance to corrosion.

CONCLUSION.

Practical experience with season cracking indicates that ammonia is not the only corrosive agent which causes cracking in overstressed copper alloys, but that the corrosion which results from the common conditions of exposure also produces cracking. Ammonia, therefore, may be regarded as a representative corrosive agent, although it attacks these alloys more quickly than the average exposure. The test with ammonia may be regarded as an accelerated test which in a few hours produces results which ordinarily would require days, weeks or months to develop, but which do not differ in kind from the results of the more common forms of exposure. Since all copper alloys in practical use are exposed to various corrosive agents it is probable that sooner or later all metal in use will be affected by corrosion, just as much as the test specimens in the tests here reported. Therefore, it follows that the results obtained from these tests may be expected wherever copper alloys are permanently stressed ovr 20,000 lb. per sq. in.

It seems, therefore, that we are justified in drawing the conclusion that forgible brass and gun metal, and probably copper alloys in general, should never be stressed in practice to 20,000 lb. per sq. in. In other words, 20,000 lb. per sq. in. should be regarded as the practical ultimate strength of this group of materials. The working stress should therefore be taken as a safe fraction of this stress, say 5,000 lb. per sq. in.

An important corollary of this conclusion is that the process of manufacturing rods of copper alloys must be so planned that no appreciable initial tensile stress is left in the surface of the rod, and that the proper inspection of drawn rods must include strain measurements.[1] Another important corollary is that copper alloys cannot be depended on where the stress is indeterminate, for in such cases it may or may not exceed the safe stress. These alloys, therefore, should not be used for important bolts when there is the least occasion for drawing them up very tight.

[1] For description of such measurements, see article by the writer, "Cracking of Drawn Brass," Engineering Record, April 11, 1914.

SAFETY IN FOUNDRY OPERATIONS*

An Interesting Account of the Methods Pursued by a Large Manufacturing Company for the Conservation of Life and Limb.

By Magnus W. Alexander.†

(Concluded from June.)

In spite of all efforts for their prevention, accidents will nevertheless occur; some cannot be prevented and others will be caused by the carelessness or heedlessness of employes or employers. After accidents have happened, it becomes at once a vital issue to minimize the consequences of injuries resulting therefrom, in order to restore the injured quickly to industrial usefulness. Large concerns can and ought to afford the employment of physicians for the treatment of injured employes; smaller concerns may not be able to do it and therefore may be obliged to rely on periodical visits of physicians to their factories or upon the calllng in of nearby physicians whenever their service is required. Whether the one or the other scheme is carried out, it will nevertheless be found advisable and even necessary to have specially selected men in each plant trained in first aid treatment of injured employes. Their training should be under the direction of regular physicians, who should repeat first aid lectures often enough to keep the first aid men in practice. Instruction should concern itself with the treatment of slight injuries such as cuts to the fingers, as well as with first aid to employes suffering more serious injury; moreover, it should include practice in resuscitation by the prone pressure method. Inasmuch as most foundries use electric current for one purpose or another, for lighting or in connection with electric furnaces, and often also for motor-driven machinery, electrocution of employes is a possible occurrence; in this case as well as in cases of unconsciousness from asphyxiation by gas or smoke, quick application of artificial respiration is essential, and trained men should always be available for this purpose.

First aid directions, to be effective, must be concise and clear; they do not need to contain any explanation but only a brief description of the methods to be used, provided it can be assumed with confidence that the directions have had the approval of competent medical men. The National Founders' Association has given much attention to this question and has worked out in conference with many physicians excellent first aid directions; these are printed in the association's N. F. A. Safety Bulletin, No. 17. Their adoption is recommended.

In connection with it that association has also standardized a First Aid Outfit, which I developed for the easy, convenient and sanitary storage and handling of the medicaments, bandages and tools necessary for the carrying out of the first aid directions. These paraphernalia were agreed upon by the same physicians who standardized the first aid directions. The effort was to select such remedies as would prove most harmless when handled by laymen, and which, as far as possible, could readily be obtained in drug stores.

I selected a glass jar as the principal container be-

*Address delivered at joint session of the American Foundrymen's Association and the American Institute of Metals, Chicago, September 8, 1914.

†General Electric Company, Schenectady, N. Y.

cause it permits of a more sanitary outfit than could be obtained by the ordinary wooden or metal box usually employed for first aid kits. The glass jar rests in a wire cage with extension fingers which rest on the cover of the jar and make the jar quite dust-proof on account of the rubber ring placed between the jar and its cover. Along the inside wall of the jar are grouped six glass bottles, each containing one of the prescribed medicaments and each labeled with the name of the contents, the use to which it is to be put and the dose usually required. The bottles are of such height that when corked they practically fill the space between the bottom and the cover of the jar. They are, moreover, held in place by a metal cup placed in the center of the jar and provided with wire prongs, between which the glass bottles sit. The remainder of the space between the metal cup and the inside wall of the jar is filled up with collapsible tubes containing burn ointment, with bandages of different widths and with woven wire splint. The latter consists of a piece of woven wire about 30 inches long and 4 inches wide rolled up into a roll of about 1½-inch diameter. This splint, which has already been used successfully by the Red Cross Society and in hospitals, offers a good substitute for the ordinary wooden splint of about the same size. If a wooden splint were to be used it would have to be kept separate from the jar, with the result that it might get misplaced and not be available when needed. The woven wire splint, on the other hand, can be cut to the required length to suit the condition of the fracture, and can also be so bent as to adjust itself to the shape of the broken limb and at the same time maintain the stiffness required of a splint.

Within the metal cup are placed such necessary tools as a tourniquet, safety pins, medicine glass, sanitary paper drinking cups, a piece of flannel, a pair of scissors, eye droppers, a spoon, a pair of tweezers, and a half dozen individual packages of sterile gauze. This arrangement allows most of the paraphernalia to be seen from the outside, particularly the medicaments and bandages, each of which can readily be removed from the jar after the cover has been lifted, and be replaced again in the jar without disarranging the other contents. If necessary, the metal cup can be used as a wash basin for an injured hand and the glass jar as a wash basin for an injured foot.

FIRST AID DIRECTIONS.

For the convenience of the first aid men and to avoid the loss or misplacement of a book of first aid directions, the latter have been printed on the inside of the jar cover, while on the outside of the cover appear some general directions for the care of the jar and a list of the standard contents. For shipping purposes and also as a protection against breakage in handling the jar within the foundry or workshop, the first aid jar is placed in a wooden container with cushions; the cover of the container, however, is cut out so as to allow the hand to reach in and carry the jar with its container on the regular handle cast into the cover of the jar.

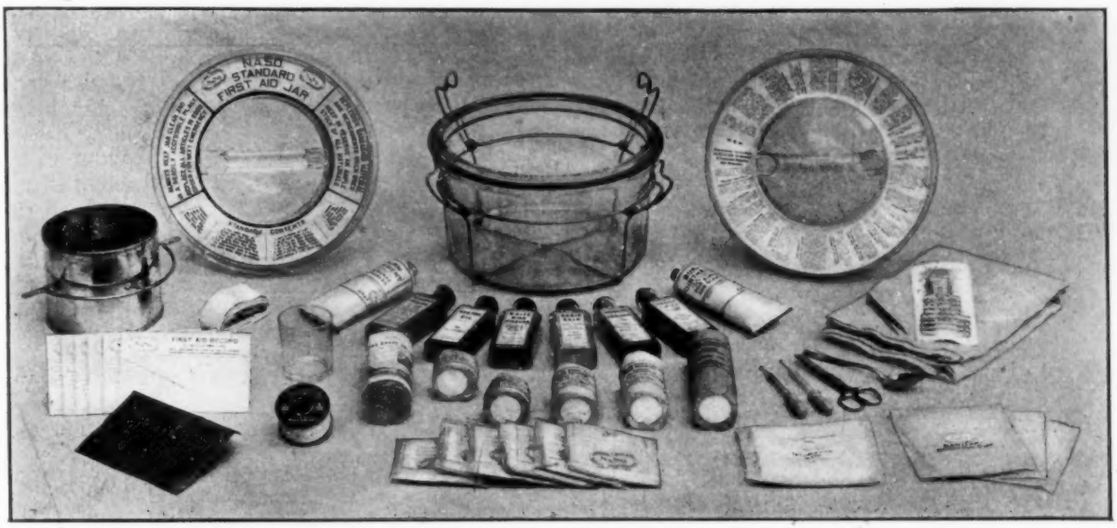


FIG. 4—STANDARD FIRST AID JAR AND CONTENTS.
(Illustration shows both sides of jar and cover.)

1 Tourniquet
1 pair nickel-plated scissors
1 pair nickel-plated tweezers
1 triangular sling
1 wire gauze splint
12 assorted safety pins
1 2-oz. bottle castor oil
2 3-oz. tubes brown ointment
1 2-oz bottle 3 per cent. alcoholic iodine
1 2-oz. bottle white wine vinegar
1 2-oz. bottle 4 per cent. aqueous boric acid
1 2-oz. bottle aromatic spirit of ammonia
1 2 oz. bottle Jamaica ginger (or substitute)
1 piece of flannel 24 x 36-inch
1 roll absorbent cotton, 1.5 oz.
1 roll 3-inch x 10 yds. gauze bandage
1 roll 2-inch x 10 yds. gauze bandage
2 rolls 1-inch x 10 yds. gauze bandage
1 spool 1-inch x 5 yds. adhesive plaster
6 packages 6 x 36-inch sterile gauze
1 teaspoon
1 metal cup
1 medicine glass
2 medicine droppers
3 paper drinking cups
First aid record cards

This first aid jar has already found the approval and has been standardized by a large number of employers and physicians, and by several of the largest national employers' associations. The jar is put under the direction and supervision of the National Founders' Association, which is selling these jars with contents at practically the price of the materials, inasmuch as it does not intend to make any commercial profit out of the transaction, but desires to be helpful to em-

ployers as well as employes in the adequate first aid treatment of injuries.

The question as to whether first aid by laymen to injured employes is advisable or not is a somewhat mooted question. Some people would rather have the injured person suffer and his wound bleed until medical skill can be secured than to take the chance of having additional harm done through the unskilled treatment of the wound by a layman. Yet if an artery is cut and life is in danger on account of the resulting excessive bleeding, when the quick and proper application of a tourniquet would temporarily stop the bleeding until the wound can receive adequate medical attention; if a person has become unconscious from an electric shock or asphyxiated by gas or smoke when immediate efforts for artificial respiration might retain the spark of life until a doctor can arrive on the scene and take charge of the patient; or if excessive pain can be relieved temporarily by proper means, it would not only seem advisable but become absolutely necessary that first aid treatment by the layman be given in all such cases. The objections of those who are ordinarily opposed to the practice of laymen treating wounds, even though they have been instructed in such treatment, can readily be overcome by the introduction of a system under which the first aid man would always make an adequate entry on a record card whenever he gives first aid attention to an injured person, and would promptly send the record card to the works physician, where there is one, or to the head office, so that all cases of first aid treatment can be followed up and injurious consequences be checked and prevented. The standard first aid jar contains a set of record cards with instructions for their use. In this way hundreds of minor injuries that happen daily in employment can receive adequate treatment by selected laymen, instead of being inadequately treated by the injured persons themselves, and yet the recording and follow-up system just outlined will make such treatment safe and unobjectionable.

As stated in the beginning of my address, safety and sanitation work must be carried on in the research spirit. The causes of accidents and resultant injuries must be studied carefully in order that they may either be eliminated or effective means be found to guard against them. More harm than good may be done by superficial work in the field of safety and sanitation; a vast amount of good, on the other hand, can be accomplished if the problem is approached in the right way and worked out in a thorough manner. It will be well to carry into this work the thought which is expressed in Shakespeare's Hamlet, Act II, Scene 2:

It now remains that we find out the cause of this effect,
Or rather say the cause of this defect,
For this effect defective comes by cause.

(The End.)

FACTORY COST ACCOUNTING

SOME REMARKS RELATING TO THE MAKING OF SELLING PRICE WITH REFERENCE TO PRODUCTION EXPENSE.

BY MATT MCKUNE.

A discussion of the subject of factory cost accounting can perhaps be well introduced by a statement of what the cost department endeavors to accomplish. The value of the end attained is appreciated by all who have anything to do with the making of a selling price, but the details of the work are little understood by even those who are vitally interested, namely, factory and salesmanagers and others upon whom falls the responsibility of selling goods or are otherwise interested in the welfare of their concern. That this is so can be readily understood, for these are busy men and are spreading themselves over a large area and also they are not specialists in this line of work, but while their lack of knowledge can be understood by the cost man, it is to him very often a severe handicap for this lack of information prevents them giving the department the support it should have in order to enable it to attain to its highest degree of efficiency. If this matter is not understood by the administrative heads of factories, it is not at all surprising that the average factory employee entirely misunderstands the purpose of the cost department and sees in its work only something which he believes to be inimical to his interest. That this is not so, I hope to be able to show further on.

With this rather lengthy preamble, we come to the statement of the purpose for which the cost department was created. The object of the cost department is to prepare statements made from factory reports, showing the value of the materials used in the construction of the article in question. The cost of the labor necessary to produce it in its finished condition and from reports from the factory, paymasters department and from the ledger such data as is necessary to compile and pro rate that important factor in the expense of any business variously known as overhead, burden, manufacturing expense, etc. The cost of the material plus the direct labor cost plus the overhead charge constituting the total cost to produce. The popular conception of cost accounting is that it is a modern institution. We have but to turn to the seventh chapter of the book of Exodus to learn that on the contrary it has existed "perhaps we concede in a very crude form" for several thousand years. The Egyptian accountant may have gone no further than to learn the average productions of the workers and to decrease the cost, compelled them to furnish the straw for the bricks in addition to the labor of making them. The details of the cost of the non-productive labor and administrative expense may not have been gone into at all and this does not interest us. We are only interested in dispelling the delusion as to the modernity of cost accounting.

Up to the last twenty-five years there was no real need of an accurate system of cost finding, the margin between the cost of production and the selling price was sufficiently wide to insure the producer against selling at a loss. The selling price was determined largely by comparing it with a similar article or by what the competitor was charging for the same kind of goods. But there came a time when manufacturers found it necessary to know something about what their goods were costing and to meet this need, estimating departments were installed. The work of the estimating department was necessarily crude, yet it is always honest and never sails under false colors as do many of our cost departments, for many of them today are but little better than estimating departments.

An estimate as defined by the compilers of the Standard Dictionary is a valuation based on opinion or incomplete data.

The work of the cost department should be entirely from records, yet the cost man today who can make up a cost ninety per cent. of which is from records counts himself fortunate. This is not his fault, but because he has not only the difficulties ordinarily encountered in any complexed task, but he has the human element to contend with, from those in charge of the bookkeeping department, who endeavor to belittle the work, down through the factory superintendents and foremen, who are often openly antagonistic, to the workman who sees in the cost man an open enemy. The work of the cost department does not begin at any one particular place and work up, but in a large plant it must start from several points at the same time. It is absolutely essential to know what the overhead charges are before a cost can be made up, so we will briefly outline the details of this work as it is conducted from this point. All money expended can be charged to one of five general expense accounts, namely to capital, selling, administrative, manufacturing indirect and the direct labor charge. It is only necessary to determine to what particular expense account any item should be charged, if to the factory for labor direct or indirect, this will be taken care of through the payroll. If for material used in the construction of goods and directly chargeable to the article, reports of kind and quantity used will be forwarded to the cost department. If for supplies which cannot be charged direct, the report of the one in charge will be forwarded to the cost department and constitute a part of the overhead expense of the department receiving them, if for repairs the material used will be charged in the same way as are supplies. If it comes under the head of administrative expense, then this is an important factor in the overhead charges. If it comes under the head of selling expense it must be kept as a separate account, so that the cost to sell may be known. While this item of expense is of interest to the cost man he generally has to be satisfied if he can secure the data absolutely necessary to his particular line of work. As it is not a factor in the cost to produce, it is simply a question for his employers to decide whether he shall handle these accounts, and they decide from his figures as to the cost to produce and the cost to sell plus the margin of profit. They thus determine the selling price or continue doing, as a very large number do, guess at the cost to sell and add say fifty per cent. for profit, which would seem to be a fair margin, but only to find at the end of the year this has shrunk to possibly ten per cent. or even less. In a general way we may say that the salaries and expense of the factory manager, general bookkeeping department, taxes, insurance comprise the administrative expense. This I will concede is not very explicit, but to go into details would require not one article, but a large volume.

The manufacturing expense starts with the purchasing department and ends when the goods are at the shipping room door. The selling expense included all work which may produce sales as a result such expense would include the special drawings of the draughting room, making of special samples; in fact, advertising in any form and the salaries and expense of salesmanagers and salesmen.

Capital expense does not affect the cost of production, therefore we need not consider it at all other than to state that it takes into consideration any increase or reduction of assets, discount, interest, etc.

It has been stated that the work of the cost department is not inimical to the workman and this can be readily proven. We can go even further and confidently predict that the time is coming when the cost department will prove to be one of the best friends of the honest workman, for it will be able to show what he is worth to his employer and he will not be dependent on the favor of a foreman in order to receive a fair return for his labor.

For a practical demonstration of this way, wages would be automatically adjusted through the records of the cost department; we will assume that the overhead charges are distributed on a percentage basis and that this expense is 100 per cent. of the direct labor charge. The wage paid we will assume to be 25 cents per hour, or $2.50 per day, and that a man will produce 10 articles in a day of 10 hours. The material charge we will estimate to be 25 cents each.

Material cost	$0.25
Labor cost	.25
Overhead 100 per cent	.25
Total cost	$0.75

It is not unusual for a very skilled workman to double the output of the slower man; the cost, if the wage rate were the same in each case, would be:

Material cost	$0.25
Labor cost	.125
Overhead cost 100 per cent	.125
Total cost	$0.50

But this man would require some inducement to exert himself to this extent if his employer can pay the less skilful man 25 cents per hour and he produces only one article in that time, they can of course pay his more skilful associate 50 cents per hour if he will double the output, that is, produce twenty finished articles in ten hours.

Material cost	$0.25
Labor cost	.25
Overhead cost	.25
Total cost	$0.75

The cost to his employer is the same, the man has doubled his wages and his employer has a contented workman who has an inducement to exert himself, and he is an example for others to imitate.

In practice the man would probably be satisfied with less money, possibly four dollars a day would be sufficient; if so, then not only he, but his employers are benefited; at four dollars per day the man producing 20 finished articles, the result would be as follows:

Material cost	$0.25
Labor cost	.20
Overhead 100 per cent	.20
Total cost	$0.65

The employee has increased his earning power by 1.50 and his employer had reduced the cost of the article ten cents.

"Necessity is the mother of inventions." The manufacturer of today knows the need of an accurate system of cost finding and many men will find in this interesting, complex problem their life work and receive for their labors sufficient renumeration, and the manufacturer will know the cost to produce and then the making of the selling price will be greatly simplified.

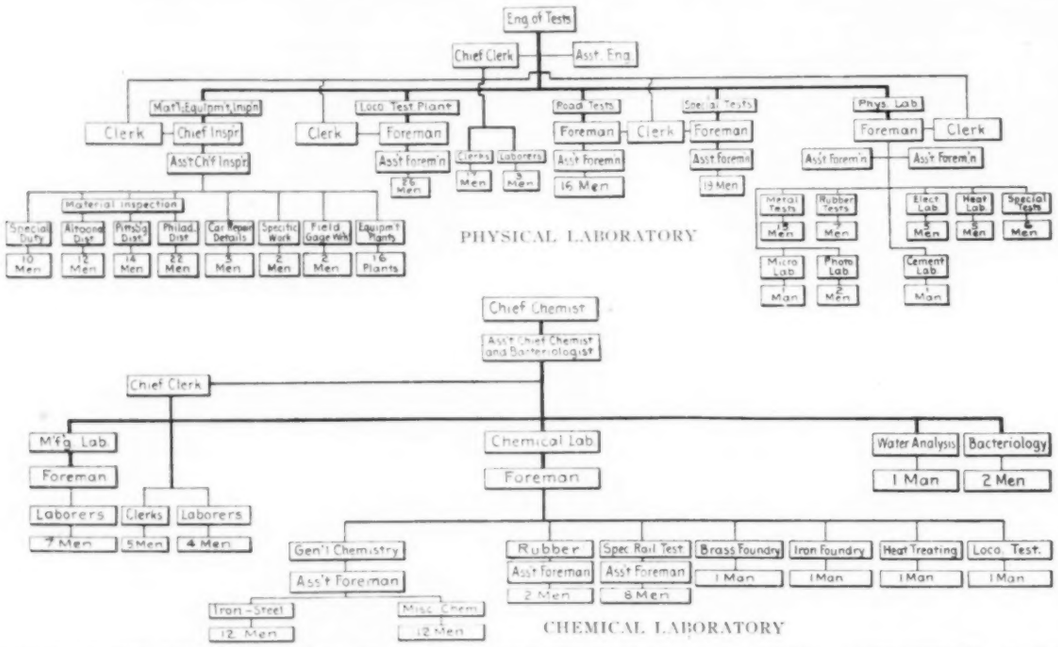
EFFICIENCY IN RAILROAD OPERATION*

The New Physical and Chemical Laboratory of the Pennsylvania Railroad Company at Altoona, Pa.

By C. D. Young.†

The New Building.

The new building at Altoona which has just been occupied is constructed of reinforced concrete, the reinforcement being of twisted bars. Structural steel cores are used in the concrete columns. The whole exterior is finished in red brick and red terra-cotta. It is arranged with a central service portion consisting of the middle bay which contains a stairway and an electric elevator, giving access to all parts. On the basement floor of the service section there is a receiving room for materials. This room communicates with the elevator for the distribution of small samples to the different sections of the building, while large pieces may be lifted to the physical-test section by means of a 10-ton traveling crane with a hatchway in the main floor. There is a machine room in the basement and in this all of the metal test specimens are prepared. On this floor there are two large fireproof vaults for the storage of letter files and the like, and a room for chemical stores.



ARRANGEMENT OF THE SCIENTIFIC STAFF OF THE PENNSYLVANIA RAILROAD TECHNICAL LABORATORIES AT ALTOONA, PA.

Description of Each Floor.

The first or street floor is devoted to physical tests. It contains a physical laboratory with five universal tension and compression testing machines, the largest of which has a capacity of 1,000,000 pounds, and all are served by the traveling crane. On this floor are separate sections for oil, cement and lagging, hose, rail, miscellaneous and heat-treatment tests.

The second floor is used for office, locker and toilet rooms, the south end being occupied by the office force of the Engineer of Tests and the north end that of the Chief Chemist.

The third floor is divided into laboratory rooms for bacteriology, rubber, water and gas analyses, photometry and lamp tests, and the calibration of electric instruments.

The whole fourth floor is used as a general chemical laboratory with a separate chemical balance room. The central bay is extended up to form a fifth floor and comprises a photographic studio and dark room, while the roof of the remaining portion of the building is used for experimental work and tests where exposure to the atmosphere is required.

Chemical Laboratory.

Metallurgical Work.—The main chemical laboratory on the fourth floor is divided by the central balance room, into two departments, the larger one of these being devoted exclusively to metallurgical chemistry. In this department methods are developed for the determination of the elements in plain-carbon steels, alloy steels, and non-ferrous alloys used for bearing backs and linings, packing-ring metal for different purposes, etc. Data are obtained leading to the development of specifications for this class of products, and samples of shipments are analyzed to determine whether they are acceptable under the specifications adopted. This steel laboratory has facilities for analyzing 100,000 samples per year.

Miscellaneous Work.—The smaller of these two laboratories is for work of a more general character, being used for the examination of fuels, the development of specifications for paint products, lubricating and burning oils, boiler compounds, lacquers, plush, car cleaners, cutting compounds, belt dressing, polishing compounds, hydraulic-jack liquids, fuses, track caps, fire-extinguishing preparations, the recovery of used or wasted products, etc.

In both of these laboratories much time has been spent in the examination of broken or "failed" parts of equipment, in an effort to determine the cause and with a view to the prevention of accidents which, aside from the money losses, might result in injuries or loss of life.

*From a paper read at meeting of American Society for Testing Materials, Atlantic City, N. J., June 22-26, 1915.

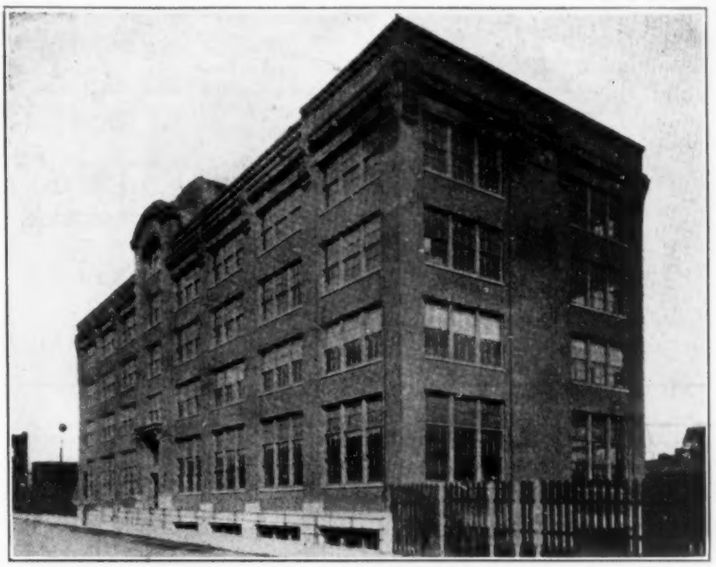
†In charge of Chemical Laboratory.

THE EXTENT AND VARIETY OF THE MATERIALS TESTED.

The scope of the work now embraced by these departments coming under the jurisdiction of Mr. J. T. Wallis, General Superintendent of Motive Power, at Altoona, can be better appreciated when it is understood that the cost of the materials covered by the inspection and tests, and entering into the construction of the railroad rolling stock and track, in 1913 amounted to $82,119,480, while the cost of operating the test department and chemical laboratory for the same year was $534,060. For an approximation and using these figures, it is interesting to observe that the total cost of operating the departments, including all additional work and inspection, is about 0.6 per cent. of the cost.

The year 1913 was perhaps a record one for the test department and laboratory, and the extent and variety of the work of the departments can be shown by a few examples for that year. There were 61,148 separate reports of material tests issued by the test department. In the physical laboratory, while no record was kept of the number of samples examined, 138,886 tests were made. These tests represented quantities such as the following:

Of bar iron 149,863,693 lb. were tested and 6,246,611 lb. rejected; of staybolt iron, 15,385 tests representing 8,301,960 lb. were made; of cement, 29,231 tests were made, representing 587,900 bbl., of which 13,600 bbl. were rejected; of wheels, 310,381 were inspected, and 1,213 were rejected; of axles 164,810 were tested and 8,035 were rejected; 290 samples, representing 56,322 yds. of plush, were tested; of air-brake hose, samples representing 634,807 were tested and 84,826 rejected.



THE PENNSYLVANIA RAILROAD COMPANY'S PHYSICAL AND CHEMICAL LABORATORY BUILDING AT ALTOONA, PA.

In the chemical laboratory, during 1913, a total of 57,309 samples were analyzed, involving about 286,545 determinations.

SOME NOTES REGARDING AMERICAN METALS AND PRODUCTS DURING WAR TIME.

EFFECT OF WAR UPON METAL PRICES.

Since the opening of the great European conflict, and the subsequent increase of exportations in metals to the warring powers, retail prices of brass, lead, zinc, aluminum and other of the commoner metals have seen considerable fluctuation, with a constant and marked trend upward.

This is true especially of brass, copper and zinc, which are used widely in the manufacture of ammunition. Antimony and lead also have climbed steadily.

Articles of hardware made up of these metals such as garden tools, farm implements and materials used in the building trades now are bringing prices far in advance of what was asked for them at this time last year. Below is a comparison of prices per pound of six of the commoner metals. The prices given are those listed July 1, 1914, and June 10, of the present year:

	July 1, 1914	June 10, 1915
Copper Lake	13.87	20.25
*Zinc	5.02½	26.25
Aluminum	17.62½	30.
Pig Tin	31.15	40.25
Pig Lead	3.90	25.

*Brass mill spelter.

CHINESE ANTIMONY FOR UNITED STATES.

A Chinese mining and smelting company has opened an office in New York for the sale of antimony in the United States. Through the New York office of the Bureau of Foreign and Domestic Commerce it was put in touch with a concern which has already purchased $40,000 worth of its antimony.

It is interesting to note that the bulk of the United States annual purchase of about 15,000,000 pounds of antimony comes from China. The following statistics for recent fiscal years ended June 30 show direct importations from China:

From—	1911	1912	1913	1914
All countries:				
Pounds	10,036,401	13,919,164	19,584,624	14,263,629
Value	$541,588	$693,218	$1,134,467	$696,362
China and Hongkong:				
Pounds	3,185,453	4,646,831	6,909,995	4,300,892
Value	$131,755	$177,663	$286,455	$190,737

England is credited in the United States customs returns as furnishing nearly half of the imports of antimony, but it is understood that most of this is from China. The desire of Chinese miners is to sell their antimony direct to American buyers.

MARKET FOR GRAPHITE PRODUCTS IN BRAZIL.

[Vice Consul Richard P. Momsen, Rio de Janeiro, May 6.]

There is a fair demand for certain graphite products in Brazil, but the official import statistics do not classify these articles separately, and it is therefore impossible to obtain accurate statistics showing the quantities consumed in this country.

About thirty foundries, many of which are small and employ but a few men, during normal business periods use a considerable number of graphite crucibles, the greater part of these being employed in the manufacture of brass and copper castings. English graphite crucibles appear to be most in favor. Since the outbreak of the European war and the general business depression here, some of the local foundries have been obliged to run on part time; consequently the demand for graphite products in general has somewhat diminished. There is some demand for graphite facings.

EDITORIAL

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Vol. 21. No. 7.

NEW YORK, JULY, 1915.

NEW SERIES
Vol. 13. No. 7.

THE METAL INDUSTRY

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ACCURATE INFORMATION

The solving of the wide variety of shop problems that comes to the office of a trade journal is often accomplished with considerable difficulty. Either the questioner does not present his view of the question with sufficient clearness or the one who undertakes to answer the question is not sufficiently practical or lacks the necessary practical experience to give a reliable and accurate solution. A worker in a foundry, plating, or polishing room usually asks a question for one of two reasons. Either from a desire to obtain the exact information that will enable him to produce the desired results, or he wishes to check up his own practice so as to be sure that he is working on improved and up-to-date lines.

In order then to be able to give the seekers after knowledge the very best and up-to-date information, it behooves the trade journal to be sure of itself when it undertakes to give such information to its readers. Not only in its answers to shop problems propounded to it, but also in its text matter in the shape of articles on trade subjects and current practice. The policy of THE METAL INDUSTRY has been from its inception to do just that. Its staff of editors and authors has always been selected with that end in view and we think the matter offered in this issue is no exception to its standard. Among the articles in this issue of THE METAL INDUSTRY that may be said to exemplify this policy is one on the REFINING OF SCRAP ZINC, and this article has been prepared to answer the large number of questions coming from users of the metal zinc who have been forced by the high price of the new metal to seek some way that will enable them to use scrap cheaply.

The information given in the aricle is authentic and complete and can be relied upon. Another article published for the same reason is one on the subject of die castings. THE SUCCESSFUL NICKEL-PLATING OF DIE CASTINGS. This article also gives information that is reliable and any one who wishes to plate with nickel on die castings may do so by *carefully* following the instructions given by Mr. Proctor in the article. Mr. Proctor has done the work and he knows it can be done and then he tells how to do it.

All of the authors of articles published in THE METAL INDUSTRY are of the same high class. We published photographs and short biographies of a half dozen of our authors in the January issue of THE METAL INDUSTRY, and in this issue we have the pleasure of presenting the faces and careers of four more, and we hope to follow these with others. These ten men are all PRACTICAL experts in their line and when they present their

ideas on paper it means that they are setting forth in cold type the results of their own every day practice. Results which they have obtained only after hard study and unremitting labor.

In sharp contrast to the information given in the columns of THE METAL INDUSTRY is that to be found in some contemporary trade journals. For instance, one journal says in answering a correspondent who asks:

"Question: What does the charcoal do that we use in covering our metal? Why could we not use any other material to cover it with and prevent oxidation, such as sand, for instance?

"Answer: The chief reason for using charcoal is that it does not contain sulphur. Unprotected in the crucible the molten metal will absorb rapidly the sulphur from the products of combustion. The charcoal also gives a reducing action which is very valuable, as it prevents the formation of oxide."

Only the last part of this answer is correct and does not really answer the question because the asker already knew that charcoal prevented oxidation.

Any chemist or metallurgist knows that sulphur given off by the products of combustion is immediately oxidized to SO_2 by combining with the oxygen of the draught before it can possibly come in contact with the metal in the crucible and when sulphur is so combined with oxygen, molten copper or any other metal cannot break up this combination. A full description of the use of charcoal in melting metals was given in THE METAL INDUSTRY of August, 1909, and we would refer this questioner to it.

The same journal treats another question as follows:

"Question: What is the effect of the small percentage of manganese in 'manganese bronze'? Is it possible to make a so-called 'manganese bronze' that actually contains no manganese?

"Answer: The only purpose of the manganese is to introduce the iron into the mixture which raises the elastic limit. The manganese acts as a carrier and only a small fraction of 1 per cent. is present. It is quite possible and practicable to have good 'manganese bronze' without the presence of manganese in the mixture."

The man who answered this question missed the principal point entirely. How does he reconcile his answer to the one given in another journal, which says when telling how to make manganese bronze:

"Melt 55 pounds of copper under charcoal, when thoroughly liquid add 1 pound of 30 per cent. manganese copper: stir the mixture and add 1.25 pounds of clean *tin plate*, push to the bottom of the copper and stir until dissolved, etc."

For the benefit of the questioner who has thus been led astray we will say that the chief office of the manganese is to act as a deoxidizer while it also does act as a carrier for the iron. There is, however, "manganese bronze," so-called, made without iron. Also we will say that manganese is absolutely essential in making a mixture, BUT the amount added may be so delicately adjusted so to nearly all "burn" or oxidize out and leave only a trace in the resulting casting.

Complete information regarding manganese bronze was published in THE METAL INDUSTRY for January and February, 1911.

Another journal says to its inquirer:

"Question: Please advise how we can make 5 per cent. phosphor tin?

"Answer: Melt your tin and then plunge phosphorous (with phosphorizer) under the surface of the tin quickly."

Here is a questioner who wants to introduce a certain amount of phosphorous in his tin. The answer he gets is simply to plunge some phosphorous into the metal. Not a word as to how much phosphorous he must burn up in the fire before he gets the necessary amount in his tin. Also not a word as to the precautions necessary in using a dangerous compound like phosphorous. A full description of phosphor tin was published in THE METAL INDUSTRY of January, 1909, and an article on the use of phosphorous appeared in the May, 1910, issue.

We will admit, however, that the author of the incomplete and dangerous answer quoted above makes an attempt to save his skin and shift the responsibility by advising the inquirer to purchase the phosphor tin ready made, but suppose the anxious inquirer follows the first part of the answer?

A few more examples of the above sort of information will amply serve to illustrate our case:

"Question: Kindly give us what you consider the best formula for a Guinea gold solution.

"Answer:

Water	1 quart
Gold chloride	27 grains
Potassium cyanide	26 ounces

Use cold, use about 15 amperes and 2 volts."

The proportion of cyanide in the above formula is 480 to 1. Any plater who knows anything about gold plating knows that it would be impossible to produce a deposit of gold with such an excess of cyanide. In cold gilding 6 parts of cyanide to 1 part of chloride of gold is the limit; in hot gilding from 4 to 4½ parts is used, and in simple immersion 16 parts to 1 is employed.

Another one is as follows:

"Question: What proportions should be used to prepare a successful copper solution for galvano work?

"Answer:

Water	1 gallon
Sulphate of copper	1 ounce
Sulphuric acid	1 ounce"

It does not seem possible that any person with the slightest knowledge of copper plating from acid copper solutions could give such information. The above proportions might prove satisfactory for *coloring* iron with copper by simple immersion, but to produce a successful copper deposit for galvano-plastic work the proportions should be as follows:

Water—1 gallon.
Sulphate of Copper—1¾ pounds.
Sulphuric Acid—3 ounces.

And so we can go on *ad nauseum*, but what we have already said is enough for our purpose. We can only repeat that THE METAL INDUSTRY stands ready at all times to give the best, most complete and accurate information in its power and invites honest criticism of its statements at any time.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

ASSOCIATE EDITORS: JESSE L. JONES, Metallurgical PETER W. BLAIR, Mechanical CHARLES H. PROCTOR, Plating

ANNEALING

Q.—How often is it necessary to anneal the metal in drawing metal shells?

A.—When drawing iron or copper annealing is necessary after two or three draws have been made, for steel and brass anneal between every other reduction at least. Tin plate or stock that cannot be annealed without spoiling the finish must ordinarily be drawn to size in one or two operations.—P. W. B. Problem 2,159.

BRONZING

Q.—Kindly let me know what is, and how to produce, Gothic bronze?

A.—Gothic bronze is a Japanese bronze, without a lustre. This finish is produced by polishing the surface of the metal with 160 emery, although for a finer surface 200 emery is used. After polishing the articles they are cleansed in the regular manner and copper plated in a cyanide or acid copper bath. Then after copper plating, the surface should be scratch brushed and immersed in a dilute solution of sulphuret of potassium or sulphide of barium, about ½ ounce to each gallon of water should be ample.

The color, as it comes from the coloring dip after washing and drying, should incline to a variegated tone of dark red; then scratch brush dry and lacquer in the usual manner. You may be able to produce the color without the preliminary scratch brushing before coloring. This will save an operation.—C. H. P. Problem 2,160.

CASTING

Q.—We are making cast aluminum hollow ware and are melting the aluminum in graphite crucibles. We find this method slow and expensive and are considering installing a furnace in which case we would use an iron pot. Do you consider this a practicable course? Would you recommend a lining which would prevent the pot from giving up iron and silicon? If so, what kind of a lining?

A.—It is considered that an iron pot is the best and most practical thing to use for the melting of aluminum, particularly in large quantities. There is a very large concern using iron pots in all of its foundries and they declare that they are getting the very best of results from same.

It is not necessary to line the pot in order to prevent the metal from taking up iron or silicon. All that is required to be careful when stirring the metal not to scrape the side of the pot with the stirring bar and the pot should be well scraped every day before being used.—K. Problem 2,161.

CHEMICAL

Q.—Please let me know the best way to make carbonate of copper out of sulphate of copper and carbonate of zinc out of sulphate of zinc?

A.—The process of preparing carbonate of copper and zinc is as follows: Dissolve any number of pounds of sulphate of copper in boiling water and then dissolve an equal amount of carbonate of soda in a separate receptacle. When dissolved add the carbonate of soda solution very slowly to the solution of sulphate of copper and constantly stirring them. Only sufficient water should be used for dissolving the sulphate and carbonate of soda.

When all the soda solution has been added the sulphate of copper will be precipitated as a corbonate. Allow to settle for some time then syphon off the clear solution of sodium sulphate. Then add hot water and again allow to settle and syphon off. This should be repeated at least four times.

When the copper is thoroughly settled and the excess of water removed it is ready for use as a plastic copper carbonate. Two pounds of sulphate of copper and 2 pounds of sodium carbonate will give an equivalent of 1 pound of dry carbonate of copper consisting of 50 per cent. metal and 50 per cent. sodium carbonate.

Zinc carbonate is produced in exactly the same manner. The amount of sulphate of zinc and sodium carbonate should be dissolved in as little boiling water as possible in separate receptacles and manipulations followed as above mentioned.

Copper and zinc cyanides are rapidly replacing the carbonates of copper and zinc. They use at least two-thirds less cyanide and give solutions at 50 per cent. less density and 25 per cent. less in cost. In modern plating operations the cyanides of the metals should be used.—C. H. P. Problem 2,162.

COLORING

Q.—We would like to know how to produce a dark blue black upon sheet steel stampings by immersing or dipping in baskets or tumbling.

A.—The gun metal finish upon steel can be produced in the following manner. Procure a good-sized iron kettle that can be heated to 600 degs. Fahrenheit and place therein sufficient nitrate of potash and add 1 per cent. of the total weight used of black oxide of manganese. Cleanse the articles by tumbling and then immerse them in nitrate for a few seconds until blue black, then remove, wash in boiling water and dry out with paraffin oil and sawdust.—C. H. P. Problem 2,163.

ENAMELLING

Q.—What chemical can be used to remove enamel that is baked at 300 degrees from automobile fenders? At the present time I am burning it off, but that warps the metal.

A.—As the enamel is practically a japan and baked on the surface, it is somewhat difficult to remove. The only material that could be used chemically for the purpose would be strong and nearly boiling solutions of caustic soda. At least 1 pound per gallon of water would be required.—C. H. P. Problem 2,164.

Q.—We are encountering difficulty in enameling metal due to black streaks radiating away from the screw hole as shown in sample. These do not show on the edge of the enamel, but merely in the center part of the panel. One would first suspect that they were cracks, but such is not the case. It is necessary, in order to get this enamel to the desired depth, that it be fired about three times, and, of course, charged as often as necessary. After the first and second firing, these black streaks do not show up. It is after the third firing that they appear. We have tried to ascertain what causes this, but have been unsuccessful. It is our opinion that it is either a chemical, that works out of the metal under the enamel, or it is some peculiarity of the color itself. When the enamel is cracked off of the metal, these dark lines will be found reproduced on the metal itself, but only as a very slight stain.

A.—The trouble you experience from black streaks in your enameled coating is undoubtedly due to the result of an almost infinitesimal coating of tin, but whether this comes up to the surface of the metal during the firing operations from the alloys of the metal, or from one of the oxides used in your enamel, which would probably be tin which separates out forming a tin

coating, before the enamel becomes fluid and this acts as a shadow and appears black from the outside of the enamel.

We have removed the enamel by bending the small piece several times and this tin or white metal coating is readily discernible, if the metal is held horizontally beneath a light at some distance and held slightly at an angle. If the tin coating develops from the purple of cassius used in the enamel and the borates used as a flux cause a precipitate of the tin while the frit is moist, then we suggest that the copper surface be previously coated with a wash of silver previous to the application of the enamel frit. This thin film of silver might produce a lighter tone to your enamel, but the streaks that appear black, but which are in reality a whitish grey, would be eliminated.—C. H. P. Problem 2,165.

GALVANIZING

Q.—Have you ever heard of Monon metal, which is said to be a kind of galvanized iron of superior acid resisting qualities? We want it for use in an exhaust acid line in a dipping room. Is it possible that it is merely a trade name for the old-fashioned galvanized iron?

A.—We have never heard of Monon metal, but if it is only, as you infer, a superior galvanized iron, then the more effective coating may be due to a certain percentage of aluminum combined with the zinc. Aluminum, as you probably know, resists sulphuric and nitric acids either in the concentrated or dilute form, but hydrochloric and hydrofluoric acid rapidly attack aluminum or zinc.

A method that is being used successfully at the present time for such purposes is to electro-galvanize the surface of the iron or steel and afterwards coat the zinc with a coating of lead. Monon metal may be something of a similar nature and "Monon" only the trade name.—C. H. P. Problem 2,166.

OXIDIZING

Q.—I am using muriatic acid, arsenic and small pieces of sulphate of copper, for oxidizing silver, but I notice that the oxidizing fades away or disappears in about ten days. I also lacquer the articles. Can you give me something that will be permanent?

A.—You are probably using too much arsenic in your combination, and we would suggest that you use less or replace it with chloride of iron. It is the arsenic, when in excess, that fades out.

For applying the oxidizing agent with a brush there is no better method than to produce a concentrated solution of sulphuret of potassium or sulphide of barium, mixed with a little caustic potash or hydro-sulphuret of ammonium in its concentrated form. As soon as either of these mixtures are applied to the silver plated surface with a brush they should be heated over a bunsen flame for a second or two. The black finish will develop at once.

This method is used by the silverware manufacturers of the east and is found to be the most effective of any.—C. H. P. Problem 2,167.

MELTING

Q.—What form of melting furnace is most suitable for the melting and pouring of zinc? We have been told that we could use a furnace with a tap on the bottom.

A.—Our experience teaches us that a furnace used for the melting of zinc with a bottom tap spout cannot be satisfactorily used, owing to the tendency of dross to form, which, being heavier than the molten metal, will sink to the bottom and eventually clog the spout. It seems to us that a tilting crucible furnace should be the apparatus employed, particularly if the zinc to be melted is to be poured into zinc castings. Where zinc is melted for the purpose of coating iron or steel sheets or other articles an iron tank is the most economical and convenient receptacle for holding the metal, principally owing to the fact that it is difficult to obtain graphite receptacles of proper size and shape and then, too, the iron is more durable and will withstand the strain of holding the mass of melted metal.

But in the case of simply melting the zinc for the purpose of pouring it in castings, the crucible furnace would be our preference, as in this way there is no chance for the zinc to become contaminated with iron and less dross will consequently be formed. If it is not desired to completely empty out the charge of molten zinc each time, of course the dross will be considerably more than when the metal is merely melted and poured. Any dross remaining in the bottom of the crucible may be dipped out with a perforated ladle allowing the clear metal to drip from it and the dross put aside for further treatment. This treatment may consist of either a sweating process, or, if sufficiently free from pure zinc, the dross may be worked up directly in a zinc distilling furnace.—K. Problem 2,168.

MOLDING

Q.—Please advise us how to prevent cores sticking to the metal mold of a Hewlett and Demmler core machine and a good core mixture for same. We are using boiled linseed oil.

A.—Your trouble of the cores sticking to the shape is due to the fact that you are using too much oil in your mixture, you state you are using boiled linseed oil. I would suggest a better oil for this work, known as Holland core oil. Try the following for your mixture of sand: one pint of oil and one-half pint of molasses, add enough water to mix the oil and molasses.

A good mixture for yellow brass and one that will blow satisfactorily on a Hewlett & Demmler machine is:

15 parts	burnt molding sand
45 parts	beach sand
3 parts	molasses
1 part	Holland core oil

—W. J. R.

Problem 2,169.

PLATING

Q.—We would like to get a good formula for a solution made up with both silver and nickel.

A.—The following formula, composed of silver and nickel, will give you excellent results:

Water	1 gallon
Sodium cyanide 129%	4 ounces
Silver cyanide 80½%	3 ounces
Nickel cyanide	1 ounce
Sal ammoniac	⅓ ounce

If less metal is required in the solution than the above proportions, which would be a little over three ounces of metal per gallon, then the proportions should be reduced accordingly. For bright deposits of the usual bisulphide of carbon, ether and cyanide may be used. Voltage required will approximate about 2 volts.—C. H. P. Problem 2,170.

Q.—Will you kindly furnish us with the following information?

First—The most advantageous method of treating battery lead plates in a reverberatory furnace.

Second—The most advantageous method of treating acid tin dross in a reverberatory furnace, and also in a small crucible to test samples.

Third—The treatment of lead sulphate, and also tin sulphate in both a reverberatory furnace, and in a small crucible as a test for samples.

A. First—A flux composed of equal parts of caustic soda and hyposulphite of soda is said to be useful in treating old lead storage battery plates. About 100 pounds of flux are used to a 5,000 pound heat and the flux will remove arsenic, antimony, zinc and other impurities, giving a soft, rather pure lead. The slag can be sold to some one who has a blast furnace.

Second—The cyanide method of assay is the best for tin, but it is rather dangerous. Satisfactory results may be obtained by the use of bicarbonate of soda, charcoal, a little borax and a little common salt. Whichever method is used it is advisable to analyze the resulting button. A plan that might be tried on acid tin dross is washing with dilute hydrochloric acid to remove zinc chloride, etc., following with hot water.

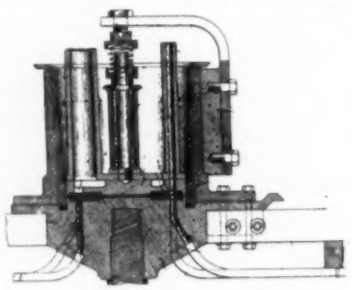
Third—Lead sulphate and battery mud are said to be very good sulphurizers and to be valuable to those running down mixed metal drosses in the blast furnace, but it is not considered advisable to attempt to handle such material in a reverberatory furnace.—J. L. J. Problem 2,171.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY

1,138,284. May 4, 1915. **Metallurgical Apparatus.** H. B. Faber, Brooklyn, N. Y.

While this invention relates generally to metallurgical apparatus where excessive corrosion occurs incident to galvanic action resultant from contact of dissimilar metals in the presence of dissociating solution, the invention is best illustrated as applied to the rotary type of metallurgical filter, as shown in cut, and is, therefore, graphically presented in this form in the specific embodiment selected as representing the preferred physical incorporation of the invention.

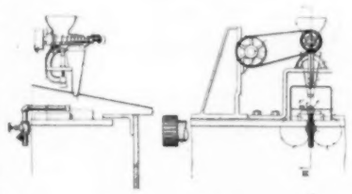


The primary object in view is to minimize galvanic action, and a resulting object is the obviation of corrosition incident to contact of dissimilar metals in the presence of dissociating solution.

The patent covers: "In metallurgical apparatus, parts formed of such dissimilar metals as are possessed of capacity for largely resisting corrosion in the presence of dissociating solvent, and a sheet of a third metal possessed of capacity for largely resisting dissociation in the presence of dissociating solvent, said sheet being disposed between and preventing contact of the first-named parts and largely preventing galvanic action."

1,140,898. May 25, 1915. **Method of Galvanizing.** William Gibson, Sr., of Vandergrift, and Robert Skemp, of Scottdale, Pa., assignors to American Sheet & Tin Plate Company, of Pittsburgh, Pa., a corporation of New Jersey.

One object of this invention is to provide, as shown in cut, a novel method of coating iron and steel sheets or other articles whereby the formation and accumulation of films or layers of metallic oxid on the surface of the molten metal is to a considerable extent prevented and overcome, and damage to the coated materials delivered from the galvanizing pot or other receptacle containing the molten coating is avoided.



Another object of the invention is to secure fluidity and prevent oxidation of the molten metal on the surfaces of the sheets or other articles being coated, and thereby secure uniformity of coating and obtain the desired lustrous appearance of the coated materials.

A further object of this invention is to provide novel means whereby the steps of our improved method are carried out or effected.

1,139,923. May 18, 1915. **Compound for Welding Aluminum and Aluminum-Containing Alloys.** Erland Thaulow, of Fredericksberg, near Copenhagen, Denmark.

This patent covers:

A welding compound for aluminum and aluminum-containing alloys, including a borate and a bisulfate of an alkali metal, such as sodium.

A flux for welding aluminum, consisting of a mixture of borax and bisulfate of an alkali metal, the mixture having a lower melting-point than that of aluminum.

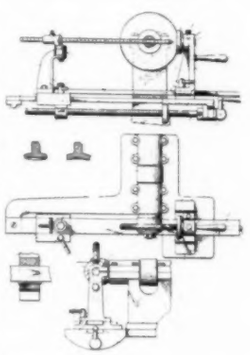
1,140,417. May 25, 1915. **Flexible Tubing.** Charles Walfrid Svenson, of New Britain, Conn., assignor to the American Hardware Corporation, of New Britain, Conn., a corporation of Conecticut.

This invention relates to flexible shafting or tubing, and more particularly to means for coupling or interlocking a sleeve member to one end of such a flexible tubing.

The flexible tubing of the present invention is of a construction, as shown in cut, more particularly adapted for use in connection with transmission for speedometers and the like, but is, of course, not necessarily limited to this particular use, the tubing serving as a guide and covering for flexible transmission shafting which extends from the driving pinion to the speedometer mechanism itself.

1,140,421. May 25, 1915. **Double-Radius Grinding-Machine.** Charles F. Wall and Frederick Harker, of Philadelphia, Pa.

This invention relates to a machine for buffing or polishing the inner surfaces of parabolic or other concave reflectors or articles, and its object is to provide a buffing or polishing element which will contact evenly at all points the surface to be polished and may be adjusted to conform to surfaces having different curvatures.



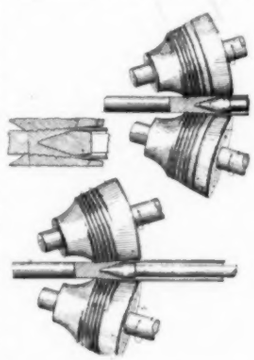
A further object is to secure an even pressure at all points of the buffer against the surface to be polished and a continuous motion thereof transversely of the plane of a longitudinal axial rotation of the work.

With these and other ends in view, the invention consists, as shown in cut, in providing a flexible buffing or polishing member and a forming member therefor to cause said buffing member to assume a shape in conformity to the curvature of the surface of the work.

1,141,424. June 1, 1915. **Manufacture of Seamless Tubes.** F. E. Simpkins, Youngstown, Ohio.

One object of this invention is to provide for so manipulating the metal while in the roll pass in which it is pierced as to prevent slipping, and thus avoid the injurious effects of friction.

A further purpose is to secure the necessary rolling action, as shown in cut, with the least or shortest extent of rolling contact, with the active portion of the pass and the mandrel so arranged as to keep the metal free from distorting strains.



The invention contemplates gripping the metal by a kneading, surface-displacing action opposite the mandrel point, and also preferably in advance of and at the rear of the mandrel point where the resistance of the metal and its tendency to slip are greatest. This gripping and kneading toughens the metal and improves its quality without injuriously disarranging its fiber, the roll surface irregularities being of such form as to indent and knead the metal by a displacing action due to pressure as distinguished from cutting or shearing.

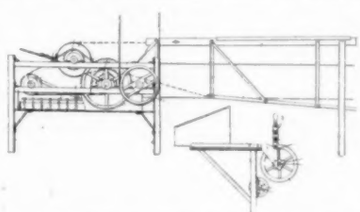
1,141,143. June 1, 1915. **Rotary Polishing-Brush.** A. L. Radlein and G. Selander, Chicago, Ill.

This invention relates to that class of rotary polishing wheels or brushes used in the metal polishing trade in which the polishing portion is formed by a disk like pad of woven fabric mounted on a central carrying hub. And the present improvement has for its object to provide a simple and efficient structural arrangement and combination of a series of woven fabric disks whereby the required diameter for effective polishing action is attained with a series of smaller disks, and by means of which the ordinary polishing disks when worn down to an inefficient size for practical use in the ordinary way can be utilized for further and effective work, as will be seen in the cut

1,141,209. June 1, 1915. **Machine for Painting Tin and Other Metals.** W. E. Philip, Baltimore, Md.

This invention relates to improvements in machines for painting tin and other metals, and is especially adapted for painting roofing tin after it has been made up into long pieces or strips.

It is customary to solder a number of sheets of tin together until the desired lengths are produced and then paint one side thereof, and after they are dried roll them into suitable size rolls for shipment, or for the purpose of convenience in handling. By the use of my present invention the pieces or strips, after being made up, are placed under a long table or drier and are picked up one at a time and carried through the machine and each strip or piece is painted, dried and rolled up into a suitable size roll.

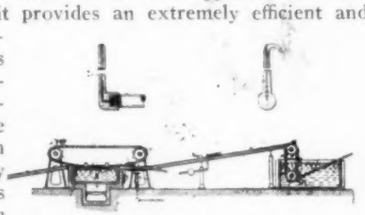


The invention consists of the novel construction and arrangement of the parts and combination of parts shown in the cut.

1,141,930. June 8, 1915. **Apparatus for Galvanizing.** Newton W. Buch, of New Castle, Pennsylvania, assignor to Safety Armorite Conduct Company, of Pittsburgh, Pennsylvania, a corporation of Pennsylvania.

This invention relates to the galvanizing of pipes, bars, etc., and the apparatus is designed to continuously carry out a method, as shown in cut, of novel character by means of which the work of galvanizing may be rapidly and thoroughly performed.

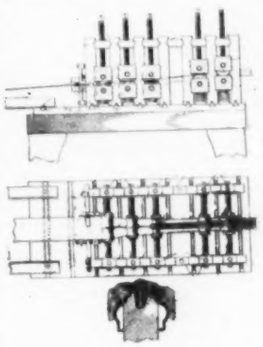
The advantages of the invention will be apparent to those skilled in the art, since it provides an extremely efficient and rapid method of galvanizing pipe. The apparatus also overcomes the difficulties which have heretofore been experienced due to the rapid vaporization within the pipe of any moisture such as remains from the acid bath, as the vapor can pass off through the openings in the supporting members.



The patent covers apparatus for hot galvanizing, comprising a tank for containing the galvanizing material, a conveyer arranged over said tank, and supporting devices adapted to detachably engage the conveyer and also to engage the pipes to suspend them within the galvanizing material within the tank, said supporting devices having means for closing the ends of the pipe against the entrance of the galvanizing material into the interior of the pipe, substantially as described.

1,142,242. June 8. **Apparatus for Forming Sheet Metal in Shapes.** Alfred J. Ellis and Charles E. Nellis, of Woodcliffe-on-Hudson, New Jersey, assignors to A. J. Ellis, Inc., a corporation of New Jersey.

This invention relates to apparatus for rolling sheet material into forms adapted for use as molding and the like, such forms being of any desired configuration in cross-section and of indefinite length.

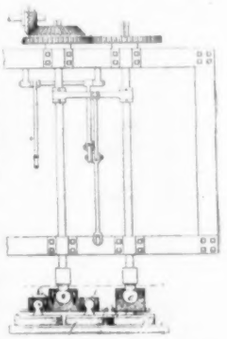


By the means disclosed herein a strip of sheet metal or the like may be molded or rolled into the desired form by passing the same through a series of fluting rolls of different shapes, as shown in cut, the material being preferably drawn through the said rolls and thereby maintained straight after delivery therefrom; while if inadvertently or for any reason deformed by longitudinal curvature, such material is straightened by the tension to which it is subjected.

A further object of the invention is to so conduct the rolling operation proper that such deformation will be substantially obviated.

1,142,570. June 8, 1915. **Polishing-Machine.** W. La Hodny, Buffalo, N. Y.

The object of this invention is to avoid objectional features heretofore existing in the polishing of glass and to provide an efficient polishing device which will polish rapidly and perfectly, will draw the rouge in under it, will cause the polishing pad to wear evenly throughout the extent of its surface and always remain flat, notwithstanding irregularities in the surface of the work, will prevent the drying and caking of the rouge on the pad and will operate to free itself of gritty particles in such a way as to avoid scratching the surface of the work. This is accomplished by constructing the polishing device with a rotary carrier or body, as shown in cut, on which polishing heads are mounted, so that they revolve with the carrier and are also free to be rotated by frictional contact with the surface of the work about axes eccentric to the axis of the carrier, and to assume positions at an angle to the plane of rotation of the carrier, so as to bear flat upon the surface being polished when the surface is not level, or is uneven.



1,142,711. June 8, 1915. **Finishing Metal Joints.** Joel L. Isaacs, of New, York, N. Y., assignor to Simmons Manufacturing Company, of Kenosha, Wisconsin, a corporation of Wisconsin.

One of the aims and objects of this invention is a method of producing and finishing a brass tube joint in such a manner that it is not at all conspicuous, and is, in fact, practically concealed. In carrying out the improved method a strip of metal filler, as shown in cut, desirably of the same color as the covering sleeve, is anchored and secured in the joint of the two edges of the sheet metal packet at the time the inner tube or pipe is covered thereby, provided such an inner tube is employed, and preferably subsequently is melted, brazed, welded or rolled or pressed down to fill the joint completely, and present an exterior surface of the same color and flush with that of the jacket proper, heat or other means being used, if desired or necessary, to soften the filler just previous to the crushing or joint-filling operation. Such filler may be a separate strip locked in the joint, or may constitute a portion of and be integral with the sheet-metal. In the former instance it is usually feasible and desirable to have the filler of soft metal, owing to the greater ease with which it may be rolled or melted to completely fill the gap.

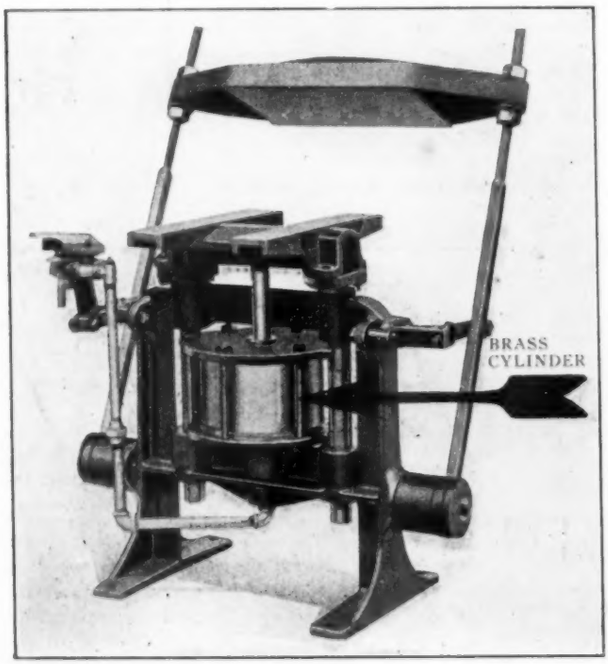
EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

B AND B MOLDING MACHINE

The machine shown in the cut is claimed to have several features that appeal to foundrymen, such as a brass cylinder; a manner of controlling the piston stroke by throttling the air in the cylinder, and the ease with which the machine can be assembled or knocked down.

The cylinder consists of a brass shell clamped between cast iron heads. The piston head is fitted with a simple leather packing. The cylinder is centered over an air inlet provided through the lower cross bars of the frame, and is locked in position when the upright guides of the table passing through slots in the cylinder head are lowered into the frame. It is,



THE B & B POWER MOLDING MACHINE.

therefore, apparent that lifting the table out of the frame also releases the cylinders so that when disconnected from the air line it can be taken out freely, and other cylinders can be readily inserted. The cylinders are made in three sizes, namely, 7, 8 and 10 inches. The guide posts move in accurately machined sleeves, which can be readily renewed to take up wear.

The use of the brass cylinder is chiefly of advantage in preventing the rusting of machines operated only intermittently. The common delays incident to putting an idle machine into service are thus avoided, as well as deterioration due to corrosion. The smooth action of the pressure stroke and its return is obtained by a small opening in the upper end of the cylinder, through which the air exhausting above the piston or reentering with the gravity return the table is throttled. The travel of the piston upward is controlled by the rate of egress of air.

The machine is fool-proof, and in the event of air being turned on when there is no mold mounted between the squeezer plates, the possibility of damaging the machine is eliminated by virtue of the air cushion above the piston, this pressure in turn effecting an automatic release of the operating pressure.

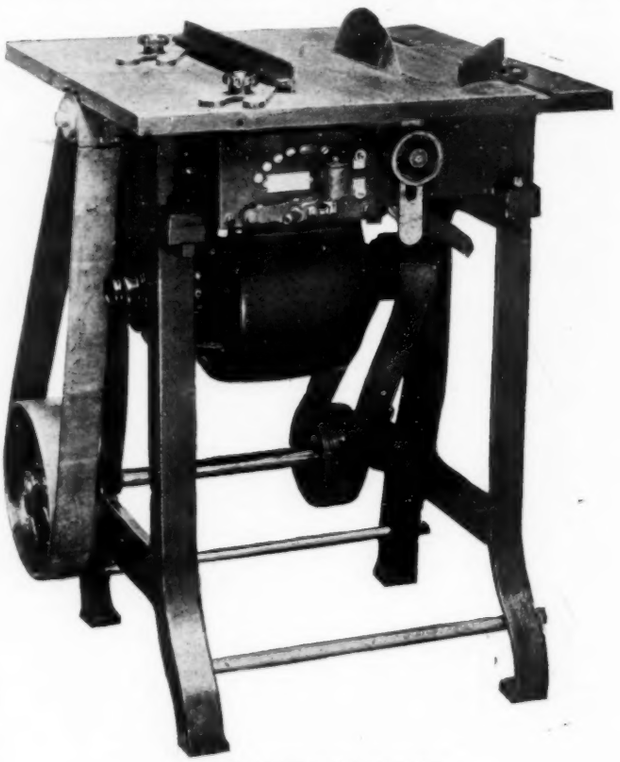
The machine is now built in 24 inch and 30 inch sizes, the dimensions being the clearance between the side rods. Portable machines embodying the same features are also built in sizes up to 36 inches. These machines have a capacity equivalent to other machines of like sizes. The stroke of the piston is 3¼ inch, and the various sizes of cylinders that can be inserted to suit the class of work or air pressure available, make this machine very flexible. The following table gives the pressures obtainable from varying air line pressures, and cylinder diameter:

Diameter of cylinder, inches	Air Pressure 40 pounds	60 pounds	80 pounds	100 pounds
7.....	1,431	2,146	2,862	3,578
8.....	1,886	2,830	3,773	4,717
10.....	2,986	4,479	5,972	7,466

This machine is manufactured by the B. & B. Manufacturing Company, Indianapolis, Ind., of which W. I. Ballentine is President, A. S. Bixby, Vice-President, and Wm. J. Blackmore, Secretary and Treasurer.

ACME METAL SAW TABLES

The machine shown in the cut is manufactured by the Hub Machine, Welding & Contracting Company, Philadelphia, Pa., and is adapted for cutting sheet, rod and tube brass and copper, fibre, rubber and other materials. This saw table is patented and



THE ACME SAW TABLE.

is constructed entirely of metal and occupies a space only 18 by 24 inches in extent. The table swings entirely open or may be set to saw any depth desired. The slitting gauge may be set from zero to 12 inches wide. The center of the saw mandrel is only one inch below the surface of the table, and this allows the use of small diameter saws.

The machine as built, weighs 160 pounds and is also furnished with a motor for driving attached as shown in the cut. Some of the users of this machine are the following: Warner & Swasey, Cleveland, Ohio; William Ainsworth & Sons, Denver, Col.; Leeds & Northrup Company, Philadelphia, Pa.; Morris Electric Company, Wilmington, Del.; Everhart Brass Works;

Amory Browne & Company, Boston, Mass.; Bossert Electric Construction Company, Utica, N. Y.; G. & S. Electric Company, Binghamton, N. Y.; Cincinnati Manufacturing Company, Cincinnati, Ohio; Pennsylvania Bronze Company, Philadelphia, Pa.; Hi Speed Bronze Company, Philadelphia, Pa.; Stanley Electric Company, Pittsfield, Mass.; Walker Electric Company, Philadelphia, Pa.; Wirt Electric Company, Philadelphia, Pa.; American Brass & Copper Company, New York, N. Y.; and the United States Government.

Prices will be quoted upon application to the above company.

WELDING UP SCRAP NICKEL ANODES

Some important experiments in the welding of nickel anodes by the oxy-acetylene process have just been concluded in the large plating department of The Prest-O-Lite Company, Inc., at its Indianapolis plant. As a result of these experiments and tests, worn nickel anodes which have previously been scrapped and sold at less than half price are now being reclaimed at a saving of more than 100 per cent.

The anodes used by The Prest-O-Lite Company., Inc., are castings of 90 per cent. nickel, 8 per cent. carbon and 2 per cent. iron. They are elliptical bars approximately 1½ inches by 3½ inches cross section and 30 inches long and weigh about 30 pounds. Their market value varies between 46 cents and 50

SCRAP NICKEL ANODES WELDED TOGETHER.

cents per pound. On the basis of the latter price, each 30 pound anode has a value of $15.00.

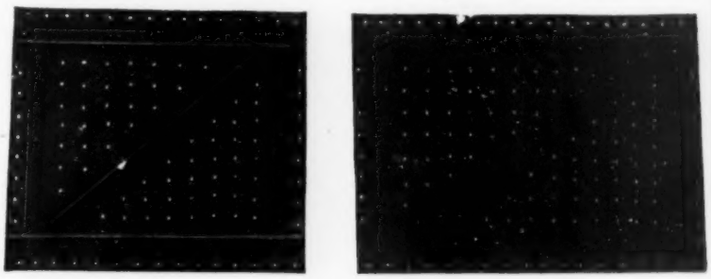
By welding up old anodes which have been in the solution, and which have a junk value of between 22 cents and 25 cents per pound. The Prest-O-Lite Company, Inc., is now converting its entire pile of scrap nickel into what are practically *new anodes* at a total cost for gas and labor of *less than 6 cents per pound.* This estimate is based on a recent issue at Indianapolis in which 421 pounds of scrap anodes were welded up at the following costs:

463 cubic feet oxygen (@ 2 cents)	$ 9.26
480 cubic feet acetylene (@ 2 cents)	9.60
24 hours labor (@ 25 cents)	6.00
Total	$24.86

In view of the fact that this test was made before any experience in the operation had been gained, it is said by the company that better results and greater savings are sure to be the result of practice.

STEEL CORE TRAYS AND BOTTOM PLATES

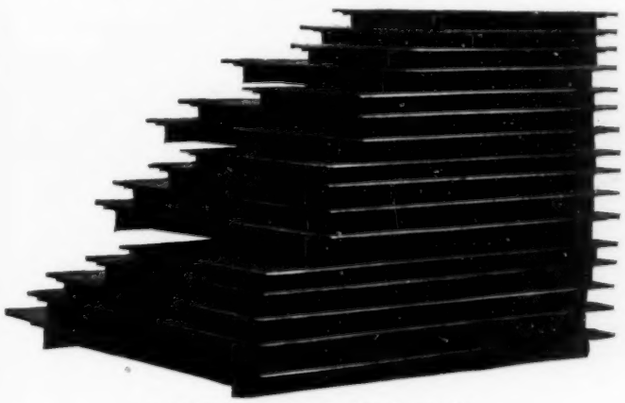
The Wadsworth Core Machine & Equipment Company, Akron, Ohio, are now manufacturing the Wadsworth Never-Break steel



WADSWORTH STEEL BOTTOM PLATES.

core trays and bottom plates, illustrations of which are here shown.

These products have the following advantages claimed for them by the manufacturers. For the steel core trays; they are unbreakable, reinforced, cheaper than making a pattern, perfectly



WADSWORTH STEEL CORE TRAYS.

straight and cheaper than cast iron, as they are only one-third the weight. A prevention against crooked cores, a condition now existing in a great many foundries, and overcome by an old experienced foundryman at a trifling cost.

For the bottom plates; they are unbreakable, can not be burnt up, cheaper than making a pattern, perfectly straight, cheaper than cast iron, as they are only one-third the weight, and a prevention against burnt bottom boards.

Standard sizes of each are carried in stock at all times.

COLORING COMPOSITION

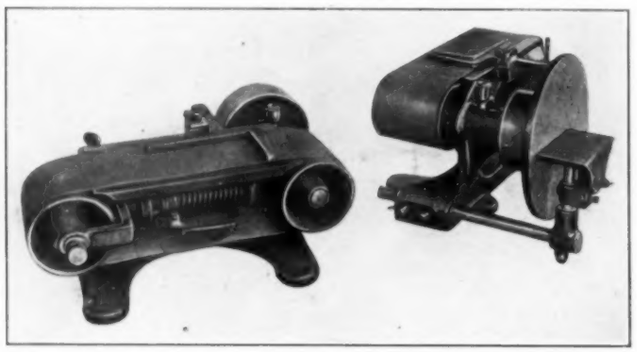
The Matchless Metal Polish Company, manufacturers of high grade metal polishes and buffing compositions, state that their compositions will offer the best solutions for coloring problems encountered by platers in the production of plain oxidized copper surfaces. They state that coloring plain oxidized copper surfaces to produce spotted or mottled effect, 75 per cent. of buffers use their XXX white diamond coloring composition. XXX white diamond will produce just as clear color as lime composition, works quicker and cleaner and the work can be laquered direct from the color wheel. XXX white diamond coloring composition is much more economical than lime composition as it requires much less to do the work. Therefore, color and cleanliness being equal, XXX white diamond being the more economical should be used on all work of this kind.

Further information may be obtained by corresponding with the above company at 840-842 West Forty-ninth Place, Chicago, Illinois.

EMERY BAND GRINDERS

The machines shown in the cut are claimed by their manufacturers to represent the practical solution of straight grained grinding troubles, as the production of this finish and sharp edges are readily accomplished by these types of machines on the various metals and other materials used in the average shop.

The parts to be finished are held lightly against the emery band, which travels over an absolutely flat surface. The bands can be changed instantly by simply releasing the tension between the pulleys. Two thumb-screws on the side provide adjustment



SIMPLEX GRINDER. DUPLEX GRINDER.

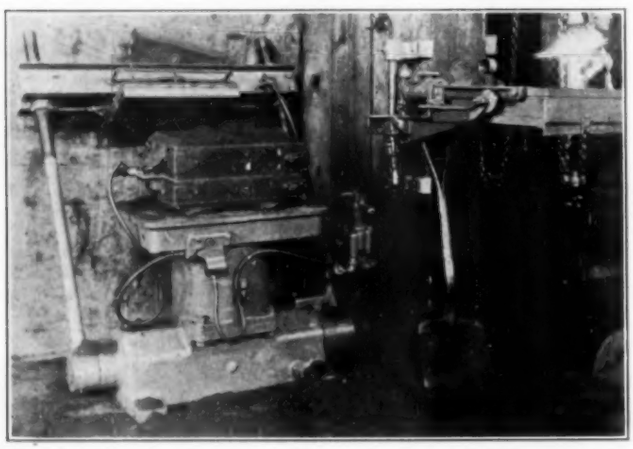
to secure parallel running of the band. Leather buffing bands for polishing are interchangeable with the emery bands. The machine shown to the right is a duplex emery band and disk grinder. The table of the disk grinder is adjustable. The flat grinding table on both machines is 10¼ by 5 inches; the abrasive band 4 inches wide and 36¼ inches long. The driving pulley is 5½ inches in diameter with 2-inch face, providing a speed of 500 to 1,100 r. p. m. The diameter of the risk is 9 inches.

These machines represent recent products of T. P. Walls Tool & Supply Company, 75 Walker street, New York, N. Y.

PNEUMATIC SIFTER

The machine shown in the accompanying illustration is the latest type of Hanna Pneumatic Sifter. It swings on a vertical shaft, which is held in brackets fastened to a wall or post, and is furnished with an automatic valve which admits air to the cylinder for starting the machine as it swings into place over the flask, and cuts off the air when swung back out of the way, this operation being almost involuntary on the part of the molder.

The screen box is rectangular in shape and arranged so that



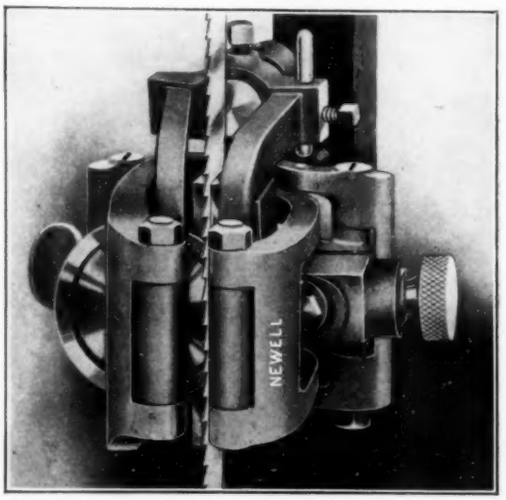
PNEUMATIC SIFTER DRAWN READY TO SQUEEZE MOLD.

screens of different meshes can be used. The wire cloth is slipped into a space between two angles and securely held in place by a capscrw and washer in front of the screen box, thus providing an easy means for changing the screen. It can be dumped and cleared of the course material by lifting one end off the frame while the other end swings on two bolts. When in operation the loose end of the box is held in place by a spring catch.

The Hanna Engineering Works, 2059 Elston Ave., Chicago, U. S. A., are the manufacturers.

AUTOMATIC BAND SAW GUIDE

The machine shown in the cut has been devised after several years of development for the purpose of automatically counteracting the tendency of a band saw to deviate from its true course. These devices, which are known as the Newell guides, are also equipped with a non-friction roller to relieve the friction on the back of the saw. This roller turns in an improved self-oiling dust-proof bearing which insures it against possibility of "sticking."



THE NEWELL SAW GUIDE.

Further information regarding these guides may be obtained by corresponding with the Automatic Saw-Guide & Machine Company, Pittsburgh, Pa.

SOAP FOR METAL WORK

A material specially intended for the cleaning of metals before plating and lacquering is now being used in the metal trades under the name of New Process Soap. This soap is claimed by the manufacturers, Fansher Brothers of Dayton, Ohio, to be better than alkali or electric cleaners, and will not corrode metals no matter how long they may be left in the bath. Expert platers who have used these compounds for sometime report that they find them to be the best cleaners obtainable both from the standpoint of endurance and economy.

It is well known that brass castings, when delivered to the plating room after having gone through the operations of cutting down and polishing on the felt and rag wheels, are very much smeared with mineral oil and vegetable fats which are hard to clean off by use of a cleaner. A formula that has been found to give very efficient service on such material as mentioned above and with only a half hour's immersion is given as follows:

Water	1 gallon
Fansher Brothers' soap	1⅔ ounces
Causticized soda (25 per cent.)	⅔ ounce
Caustic soda, granulated	⅔ ounce

In case soft water is used, omit the caustic soda.

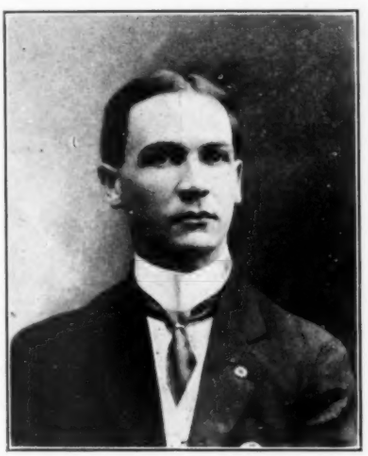
The method of making up this cleaner is to first dissolve the caustic soda in water, and after bringing it to the boiling point skim off the top. Then put in in regular order the causticized soda and then the Fansher Brothers' soap. This cleaner as made up above can be used continually every day for from twelve to fifteen days and nothing need be added to it during this time. It is recommended that it is advisable not to use the solution for more than fifteen days, but at the end of this time a new solution should be made up. This soap solution should be used at a temperature of 150 degrees Fahrenheit.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE METAL INDUSTRY ORGANIZATIONS.

AMERICAN ELECTRO-PLATERS' SOCIETY

New York Branch—Herman H. Reama, president, and William Fischer, Sec'y, 345 East 23rd st., New York, N. Y. An open meeting of this branch was held on June 11 at their rooms 258 Pearl street. There was a good attendance and C. Upham Ely gave an interesting talk on his experiences with nickel and cobalt anodes, which was followed by the usual business and lessons in chemistry. The regular monthly meeting was held on June 25, at which time the newly elected officers were installed and the annual financial statement and the delegate's report on the annual convention were read. A demonstration of cobalt plating was given by Charles Buchanan. The next monthly meeting will be held on Friday, July 23.



H. H. REAMA,
President.

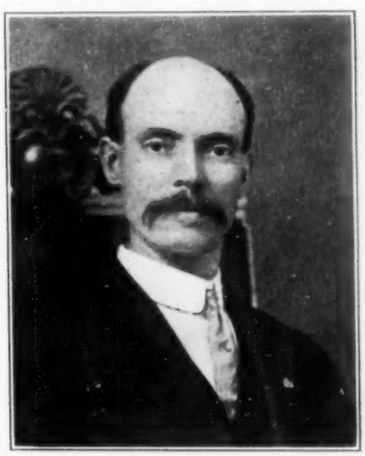
Newark Branch—E. W. T. Faint, president, and George Reuter, Sec'y, 175 So. 11th st., Newark, N. J.—This branch held a most interesting meeting at their rooms, 47 Bank street, on June 18, 1915, and which was attended by upwards of fifty electro-platers and others interested in the subject of electro-deposition of metals. Dr. Oliver P. Watts, of the University of Wisconsin, was a guest of the branch and gave an interesting address on the work that the association was doing. At the close of his talk he placed himself at the disposal of the members and answered questions bearing on the chemical re-action entering into electrolytic deposition. A report was read from George B. Hogaboom of the New York branch who represented the Newark branch at the convention held in June at Dayton, Ohio.

The exhibit of the Foundry & Machine Exhibition Company will be held on Young's Million Dollar Pier. The meetings will be held either there or in the hotel. This is to be decided later.

The program for this year is coming along unusually well. The provisional program is as follows: D. H. Newland, Assistant State Geologist, New York—"Albany Sand"; A. D. Flinn, Board of Water Supply, New York—"Experience with Brass in Civil Engineering Work"; C. P. Karr, Bureau of Standards—"Molding Sand"; Charles Pack Doehler Die Casting Company, New York—"Aluminum Die Casting Work"; Dr. Burgess and Dr. Merica, Bureau of Standards, Washington, D. C.—"Cracking of Wrought Brass from Overstrain"; William W. Clark, Seymour Manufacturing Company—"Manufacture and Use of Alumino-Vanadium"; C. V. Powell, British Aluminum Company, Toronto, Ont.—"Some Developments in Aluminum," and "Welding of Aluminum"; F. L. Antisell Raritan Copper Works—"Furnace Methods for Pure Copper Castings"; W. E. Mowrey, St. Paul, Minn., "Substitutes and Alloys to Take Place of Platinum"; Russell R. Clarke, Pennsylvania Lines West—"The Advantage of a Standard Railroad Car Journal Bearing Alloy"; G. H. Clamer, The Ajax Metal Company—"Effect of Zinc on Copper, Tin and Lead Alloys"; W. M. Corse, The Titanium Alloy Manufacturing Company—"Copper-Aluminum Alloys"; Jesse L. Jones, Westinghouse Electric & Manufacturing Company—"Forging Manganese Bronze"; S. L. Hoyt, Univeristy of Minnesota—"Amorphous State of Metals"; S. W. Parr, University of Illinois (Two Papers)—"Method of Analysis for Complex Alloys," and "Development on Acid Resistance Alloys"; Dr. Rawdon, Bureau of Standards, Washington—"Metallographical Examination of 88-10-2 Alloy"; F. A. J. FitzGerald, FitzGerald Laboratories—"Electric Furnaces for Brass Melting"; H. T. Kalmus, Kalmus, Comstock & Westcott, Inc.—"Cobalt in Non-Ferrous Metals"; Dr. S. Trood, U. S. Sherardizing Company—"The Electric Furnace for Sherardizing."

JOSEPH MINGES,
Vice-President.

WM. FISCHER,
Secretary-Treasurer.



JOHN PAINTER,
Recording Secretary.

OFFICERS OF NEW YORK BRANCH AMERICAN ELECTRO-PLATERS' SOCIETY

AMERICAN INSTITUTE OF METALS

The June Bulletin gives the following information relating to the convention which will be held in Atlantic City, N. J., September 28 to October 1 at their headquarters in the Hotel Traymore.

PERSONALS

ITEMS OF INTEREST TO THE INDIVIDUAL.

A QUARTETTE OF THE METAL INDUSTRY AUTHORS, SERIES II

PETER W. BLAIR

Peter W. Blair, the well known and most versatile writer who has for some time interested readers of THE METAL INDUSTRY with his valuable articles relating to the manufacture of water, steam, gas and air brass goods, was born in Perth, Scotland, and educated in the public schools. His business career began as a brass finisher's apprentice at fourteen years of age with Messrs. Frew & Sons, brass founders in his home town. After finishing his apprenticeship he moved to Birmingham, England, where he continued his employment as a brass finisher, and then after two years came to America.

P. W. BLAIR.

His experience in this country includes a number of firms in the chandelier and electric light manufacturing business, and also in the manufacture of plumbers' brass goods. Mr. Blair became a foreman of the brass finishing department of the H. Mueller Manufacturing Company, Decatur, Ill., in 1900 and has been with that company since that time, being now located at the recently established Canadian plant of the Mueller company at Sarnia, Ontario.

Mr. Blair's long and varied experience in brass finishing has made his opinion very valuable in mechanical matters in the brass manufacturing line and he is often consulted on manufacturing problems. During his spare time he has attended technical classes conducted by the Y. M. C. A. in Cincinnati, Ohio, during the winter months.

GEORGE B. HOGABOOM

This tireless bundle of energy was born in Brooklyn, N. Y., educated in the public schools and Pratt Institute of that city, and finally graduated from the Newark Technical High School, Newark, N. J.

G. B. HOGABOOM.

Mr. Hogaboom has been following the plating industry since he was fourteen years old and has made remarkably few changes, now being connected with the plating department of P. & F. Corbin, New Britain, Conn. Mr. Hogaboom was one of the organizers of the American Electro-Platers' Society, and has been one of the most enegetic and indefatigable workers in the advancement of the society ever since. He was the first president of the supreme society, and is now one of the board of trustees and a prominent speaker and contributor to the plating literature of the day.

OSCAR A. HILLMAN

Oscar A. Hillman was born in Osterville, Mass., and in 1895 entered a laboratory conducted by his father. From 1897 on Mr. Hillman has been associated with various concerns in the capacity of either chemist, plater or superintendent. Possibly the position in which Mr. Hillman became best known to the readers of THE METAL INDUSTRY was through his incumbency of the superintendency of the coloring, finishing and assaying departments of the Charles M. Robbins Company, jewelers, silversmiths and enamelers, Attleboro, Mass., as it was at this period that he became a liberal contributor to THE METAL INDUSTRY.

O. A. HILLMAN.

The unique part of Mr. Hillman's history is that he has always had access to a well equipped laboratory since he was twelve years old, and since 1909 he has been the principal owner of the laboratory known to the trade as Oscar A. Hillman & Company. Mr. Hillman is at present connected with McRae & Keeler, manufacturing jewelers, Attleboro, Mass.

Mr. Hillman is the author of a number of articles that have been published in THE METAL INDUSTRY from time to time, notable among which is his long article on "Metallurgy for Manufacturing Jewelers," which is considered as standard authority on the subject.

EMANUEL BLASSETT, JR.

Emanuel Blassett, Jr., who is well known to readers of THE METAL INDUSTRY as an expert on the plating and finishing of metals, was born in Fairfield, Conn. After a preliminary education in the primary schools he drifted away from the farm on which he was born and began his commercial career. After passing through various stages of business employment ranging from a postal telegraph company to the foremanship of a plating department, he discovered that he was interested in electrochemistry.

E. BLASSETT, JR.

He graduated from the Rutherford Institute at New Haven, Conn., as a chemical expert and then took charge of the plating department of the Burlington Plating & Mirror Company, Burlington, Vt., where he is still to be found at this time conducting the business under the name of E. Blassett & Company, having succeeded to the proprietorship on the death of the original owner.

DEATHS

THOMAS D. WEST

Thomas D. West, chairman of the board of directors of the West Steel Casting Company, Cleveland, Ohio, died June 18, at Glenville Hospital, Cleveland, Ohio, due to injuries resulting from an automobile accident. Mr. West was one of the best known foundrymen in this country. He was born in Manchester, England, August 31, 1851 and was the son of a niece of the late eminent scientist, Dr. Michael Faraday. Mr. West began to learn the steel business at the age of 12 at the Portland Locomotive Works, Portland, Maine. All his life he had been closely associated with the founding of steel, iron and other metals.

He was president of the American Foundrymen's association in 1905-1906. He was a member of the American Society of Mechanical Engineers, American Society for Testing Materials and several other mechanical and scientific organizations and was a pioneer in safety first work.

Mr. West was known as the father of practical foundry literature and had done more than any other man to place the business on the high plane where it now stands. He was the author of many books and tracts among which are: "American Foundry Practice," "Moulders' Text Book," "Metallurgy of Cast Iron," "The Competent Life," "Accidents: Their Causes and Remedies," and several technical papers.

THOMAS D. WEST.

He is survived by a widow, Mrs. Clara West, 10,511 Pasadena avenue, and three children, Dr. Thomas J. West, of Honolulu, Ralph H. West and Mrs. William E. Ward of Cleveland.

As we go to press we learn of the death from heart disease at Asbury Park, N. J., July 6, of Andrew Allan, Sr., head of the firm of Andrew Allan and Son, metal manufacturers, of 406 Greenwich street, New York.

Mr. Allan was 78 years old and had been in the metal business all his life. He was the inventor of the famous "Allan Metal" line of bearing metals.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS AND TRADE ITEMS OF INTEREST FROM THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

WATERBURY, CONN.

JULY 6, 1915.

Industrial conditions hereabouts are practically the same as they have been the past three months. Business which has been affected by orders for war goods is very prosperous and the demand for skilled mechanics continues urgent. Normal business is only slightly better, on the whole, than it was at the end of June last year and there is still only the prospect of a resumption of prosperous trading in goods for domestic consumption. This condition affects practically every industry in the Naugatuck valley alike and only in a few instances can evidence be found of a return of healthy demand for "peace goods" from either the foreign or domestic markets.

Right here in Waterbury there is unprecedented activity in those brass factories where heavy material, tubes, products for use in the manufacture of machine guns and ordnance and other so-called "war goods" are produced. In the vicinity of the great plant of the Scovill Manufacturing Company one finds a throbbing picture of development. All over the acres immediately east of the Scovill plant great new buildings are being erected at the greatest possible speed. This has made such a demand for unskilled labor that it has had the effect of balancing conditions as to labor generally. The skilled mechanics are in demand in the present plant, which is running twenty-four hours a day. The laborers, masons, carpenters and structural gangs are finding employment on the new plant, and night and day gangs are competing for records. Already the description of these buildings has been given in these columns, but it is impossible to picture the activity and the scope of the building operations in type.

Machinery plants are still driven to their capacity by the demand from all parts of the world for machinery. The Waterbury Farrel Foundry & Machine Company, the E. J. Manville Machine Company, the Rowbottom Company, and every machine shop in this valley are going full speed and standing up to the acid test of skill in an effort that is really heroic to keep the wheels of American industry running smoothly.

Just before the war the Manville Company completed a fine large addition to its plant. This is none too roomy now and further extensions will probably be necessary soon. The Farrel plant has been growing steadily and is now one of the finest and most extensive machine plants in the country. Since the old depot was abandoned the company has gradually acquired the surrounding property and this week its purchase of the last remaining piece on Bank street, near Meadow, was recorded. It has already effaced the traces of the old Naugatuck railroad station.

It was a fine stroke of management on the part of the Chase interests by which the splendid new plant of the Chase Metal Works in Waterville was completed before the war. It is none too generous for the demands of the present. Already the offices of the company have been moved to Waterville and it will not surprise Waterburyians if the entire rolling mill enterprise is moved there, gradually, in the next ten years, so that the Waterbury Manufacturing Company may grow northward when expansion is necessary.

The American Brass Company is steadily continuing its development of plants in Waterbury and Torrington, and its Benedict & Burnham branch here continues to expand and, somehow, to demand expansion.

Brass prices and spelter prices are obviously causing thought. Every particle of scrap is closely guarded that waste may be minimized and it is an open secret that concerns which stocked up on brass when prices were low are selling back unused stock at a profit. Spelter is bought everywhere at high prices and pedlars solicit sales in junk shops, newspaper engraving plants and other unfrequented places.

Spelter is essential to the quality of war goods and the busy forces of British army inspectors operating here, in Bridgeport, Philadelphia, Chicago, Pittsburgh and other centers are keen about refusing goods which seem to have too large a percentage of lead. Waterbury plants are said to have an unusually high rating for efficiency in this respect and only a very low percentage of goods has yet been turned back.

Since last month clock business has shown a noticeable improvement, due doubtless to the suspension of German importations. Novelty business shows but a small margin of profit on account of the high price of brass. The Ingersoll plant here has begun operations on a small scale, starting on a new model medium-price watch. The new Seth Thomas Clock Company's factory in Thomaston is being rushed to completion, in anticipation of an early return of prosperity in its line.

As a result of the great demand for skilled men there has been an increase of about 2,000 in Waterbury's population in the past sixty days and conditions for labor look rosy for the next two or three years.—B. F.

BRIDGEPORT, CONN.

JULY 6, 1915.

Bridgeport is about to reap its industrial harvest. Months of ceaseless building activity, which did not pause even for the fall of night, has given to the city a manufacturing impetus so great that its momentum will carry it for years. That is what the European war has done for Bridgeport.

To say that industrial conditions here are good would be inadequate. They are superb. The worker skilled in the arts of metal can come to the city with the assurance that his services will be eagerly bought, most likely by the Remington Arms and Ammunition Company, the Remington Arms-Union Metallic Cartridge Company, the Lake Torpedo Boat Company, the Bridgeport Projectile Company, the Bridgeport Metal Goods Company, the Locomobile Company of America, and scores of other concerns which are breaking their mechanical necks to keep up with orders.

There is no place here for the floater, however. E. V. Carpenter, employment manager of the new Arms Company, whose mammoth plant is now completed to such an extent that it will everlastingly stand as a monument to capital, is forced to turn away hundreds of undesirables who come to the city seeking positions at the high wages the company pays. Capable men need look no further than Mr. Carpenter for months to come.

During the month there was a temporary obsession that the German government was to buy the arms factories here, and close them to render them useless to the Allies. For a time the report threatened to play havoc with the future of the city, but spontaneous denials from the officers here and in New York set the city at rest.

Shortly the Lake Torpedo Boat Company, which produces the type of submarine with which Germany has awed the world, will begin dredging Johnson's creek, to provide new wharfage to care for its increasing business. The mud will be used to reclaim about 17 acres of adjoining marshes, on which additions to the plant are to be erected.

The company is preparing to double its output. The machine department has already been increased to twice its former size, so that it is now possible to turn out 12 submarines a year. Should occasion arise, the capacity can be increased to 18 per year. Plans are being drawn to double the size of the draughting department, which was greatly enlarged just recently.

President Fred Enos, of the Board of Trade, has not yet succeeded in resigning from his post. His efforts in that office have been such as to make him not only an asset to Bridgeport but to New England. It was Mr. Enos' perseverance alone that brought the Arms Company here, and that is only one of many such achievements. Manufacturers and leading citizens feel that his absence from the presidency of the board would be a public disaster, and steps are being taken to offer him a salary that will adequately compensate him for devoting his entire time to the work.

For the fall of 1915, Bridgeport factories will come very near leading the country in importing metals.—E. C. D.

PLANT OF BRIDGEPORT ARMS COMPANY, BRIDGEPORT, CONN. VIEW SHOWS POWER PLANT WITH 200-FOOT STACK. THREE FACTORY UNITS IN COURSE OF CONSTRUCTION.

NEW BRITAIN, CONN.

JULY 6, 1915.

Present indications in New Britain are that the fall of 1915 will see the various metal manufacturing concerns here well supplied with orders and employing a full quota of hands. The heads of the various industries are anticipating a brisk fall trade and expect that the coming season will be a most profitable one, as the growth of trade during the past few months, following the deplorable conditions of a year ago, has been a steady and healthful one and not one that is liable to collapse the moment peace is declared in Europe as will be the case with many of the factories about the East where munitions and armaments for the warring nations are being turned out in great quantities.

The American Hardware Corporation is showing a healthy growth in business after its long lull and now most of the various departments are running on full time and with the full complement of hands. At the New Britain Machine Company day and night shifts of men are still being worked and orders are said to be so many there that the concern need not worry for lack of work for some time to come. At the Stanley Rule & Level Company, which plant suffered the most from the war, business is again picking up and the entire plant is now running five days a week instead of but four as was the case all winter. Should business warrant it, this concern will soon go on to its old time schedule. The Union Manufacturing Company, with work begun on a large factory addition, is handling all the work of which it is capable and the same is true at Landers, Frary & Clark's. The Stanley Works is also busy, there being a particularly big demand for the thousands of tons of scrap steel there.

War orders also continue to pour into New Britain and only the latter part of June the Corbin Screw Corporation received a $90,000 order from one of the European nations. The order calls for certain parts of shrapnel which is easily made at this

concern. North & Judd, which was the first big local factory to benefit from the war, continues to maintain its record breaking pace and has now received another large war order for accoutrements valued at a half million dollars. This plant deals principally with Great Britain where its goods are said to be the best.

The big machines at the Traut & Hine Manufacturing Company are also busy turning out munition, a consignment of 16,416,000 brass fasteners for the leggins of British soldiers having been ordered by the British war office. The local concern has received three orders through J. P. Morgan & Company, of New York. One is for 65,000 gross of fasteners, another for 31,500 gross of fasteners, and the third for 17,000 gross.

Up to very recently England was able to manufacture her own fasteners, but now on account of a diminished supply of raw material it has been necessary to abandon a great part of this home industry and send orders to the United States, many of them coming to New Britain, the hardware center of New England.

Although the officials of the American Hardware Corporation deny that they have received any war orders, other manufacturers consider it strange that the P. & F. Corbin division should have installed two carloads of new machinery which the company had been removing until a short time ago when it again came into favor for manufacturing war materials.—H. R. J.

BUFFALO, N. Y.

JULY 6, 1915.

A constant increase in the metal business in this city is evident everywhere. And to the writer's knowledge not a single local firm can be said as "slowing up," but instead they are "speeding up." Some firms show a more marked improvement than others. However, money continues to be tight as complaints were heard everywhere that collections were extremely slow.

Metals and their prices continue to bother the local men. For example, one local firm was forced to give up the idea of accepting a milion pound casting order because it was unable to get enough spelter and the uncertainty of prices. Then again the metal men seem a bit nervous because they believe that the prices of metals are playing "tag" with the high water mark. One of the local men goes so far as to say that he was talking with a gentleman who offered to pay forty cents a pound for copper, which had to be delivered by a certain time.

Local foundries continue to increase their capacity. Local foundrymen say that the pattern makers are very busy and this means business for the future. Prices as quoted by some of the foundrymen, some of the metal men claim is very low. So much so that it has almost developed into a habit "cutting the other fellow's throat," a habit which is depriving some of the foundrymen of a fair profit and living. Some have suggested that the local foundrymen form an association whereby every member would pledge himself to never quote below a certain percentage of the current price of metals. As to the success, the promoters of this project will meet cannot be said at present, as some think it impractical.

The National Bronze Foundry cast the two largest bronze castings in their entire history of existence with remarkable success the other day. They were bronze beer strainers, one weighing 1,200 pounds and the other 2,300 pounds. The castings were made for one of the local brewers.

Schnell Bronze Bearing Company, Inc., report that they have been unusually busy during the month of June.

Titan Copper Products Company, Inc., are doing considerable work for the Sterling Engine Company of Buffalo. Fries & Company have been busier during the past month than for the last six.

Unique Brass Foundry Company are doing quite a bit of casting for boats in addition to their large Pierce Arrow orders. Local electroplaters are fairly busy. A good portion of the orders are "rush orders." A number of the electroplaters who have confined their territory to Buffalo are spreading out into the surrounding towns.

A. F. Flanders Manufacturing Company report a steady increase in their plating business. The Washington Plating Company are working overtime to get their rush orders out.

S. A. Day Manufacturing Company during the past month increased their forces, installed new equipment, doubled their capacity and enlarged their plant in order to accommodate their increase in business which is nation-wide.

The finishing and rolling mills are unusually busy with large orders, working their forces day and night in order to keep pace with their flood of orders. Some have placed orders which will keep them busy until the end of the year.

George Ray Manufacturing Company are getting out a new catalog of their copper, tin and aluminum wares. The catalog will be beautifully illustrated and bound in a flexible cover.

Zero Valve and Brass Manufacturing Company report that during the past month they did all the gold plate work on the local St. Joseph's Cathedral also, all the brass railing and other brass work for the Buffalo South Side High School.—G. W. G.

NIAGARA FALLS, N. Y.

JULY 6, 1915.

The local metal market while still in an abnormal condition shows more signs of improvement than last month. With some concerns this improvement is more marked than with others. And as to the future of local trade conditions various opinions are current. Some believe that business will be normal sometime this summer, the less optimistic believe it will pick up gradually until next fall, while others believe it impossible to foreshadow the future local trade conditions. Every foundry in this city is fairly busy with orders which they are constantly booking.

The Titanium Alloy Manufacturing Company are beginning to do a considerable amount of titanium aluminum bronze work for the automobile and truck manufacturers, especially such castings as gears.

After having thoroughly tested the twelve 1,200-pound copper water-cooled contact plates and three 350-pound copper water-cooled separators to be used in electric furnaces, as cast by the Frontier Brass Foundry, the Union Carbite Company for whom they were made have accepted them. A number of western New York foundrymen refused to take the job because of the chance they were taking in making a copper casting as was required by the specifications.

Finishing and stamping mills are moving along about the same pace as a month ago. Among the electroplaters in this city there has been a slight falling off of business, but a change is looked forward to by July, and which the local men believe will continue for some time.

Among the chemical and supply manufacturers an increase has been noticed during the past month, as more men are being constantly employed.

The Niagara Electro Chemical Company is fairly busy. They have made a one-story addition, about 100 feet long, to their establishment.—G. W. G.

DETROIT, MICH.

JULY 6, 1915.

Notwithstanding the fact that dynamiters have attempted to destroy factories manufacturing war supplies in Windsor, Ont., Canada, across the river from Detroit, manufacturers here show no inclination to turn down foreign orders. The plants heretofore reported as producing large quantities of war material, are still actively engaged and giving great numbers of men employment, who otherwise would be idle. While caution is being taken to avoid dynamite attacks on this side of the river, manufacturers do not express fear that they will be molested. "We are running our plants to suit ourselves," is the expression of these manufacturers. "We have installed costly machinery to do the work, and do not intend to be bull-dozed by sympathisers with any European government."

Manufacturers of brass and aluminum products, especially in automobile accessory plants, still report business in excellent condition, while the producers of plumbers' supplies would like to see better conditions. No one can complain regarding the activity in the automobile plants which are the largest consumers of brass and aluminum in the country.

Henry Ford announced the past week that he and his associates were planning the erection of an enormous plant for the manufacture of Ford tractors, a machine which, he says, will practically drive the horse from the barn and other places as a beast of burden. This plant, which Mr. Ford says he will start this summer, in Oakwood, a suburb of Detroit, will be fully as

large as his present plant in Highland Park, another suburb of Detroit. He plans to give employment to at least 20,000 men within the next two years, and further says it is his intention to see that no man is out of employment who decides to live in Detroit.

This new tractor plant will use great quantities of brass, aluminum and gray iron, and its different departments will be equipped with the best machinery that money can buy.—F. J. H.

COLUMBUS, OHIO

JULY 6, 1915.

The metal market in Columbus and central Ohio has been somewhat changeable during the past month, similar to the market elsewhere. Following a decline in most metals, there has been more strength shown all along the line. Buying is now more active on a rising market and business is generally pretty satisfactory. The tone is good and prospects for the future are believed to be rather bright. The consumption of metals in central Ohio territory appears to be on the increase, despite the business depression. Things are looking up generally and metals are expected to share in the general recovery.

Lead has been a little slow and sold around 6¼ cents towards the latter part of June. Spelter has been in fair demand although quotations were off a little. Brass is in better demand and the volume of business is increasing. Yellow brass scraps are selling for 16 cents while red scraps are selling around 14 cents. Aluminum is in better shape and is higher than a month ago. It is now quoted from 23 to 25 cents. Copper is also up and other metals are showing more strength.

The Monarch Aluminum Ware Company of Cleveland, Ohio, has filed papers with the Secretary of State increasing its capital stock from $10,000 to $20,000.

The Ohio Zinc Company of Columbus, Ohio, has been incorporated with a capital stock of $25,000. The incorporators are C. A. Phelps, W. B. Warwick, C. W. Warwick, F. R. Chapman and F. P. Jackson.

The Cust Flohr Company of Mansfield, Ohio, has been incorporated with a capital stock of $5,000 to deal in tin and sheet metal. The incorporators are Mrs. Sophia Flohr, Mrs. C. C. Cook, William Switzer, Ross C. Cook.

The Cuyahoga Stamping & Machine Company of Cleveland, Ohio, has been incorporated with a capital stock of $1,000. The incorporators are Paul O. Kassulker, G. N. Shaver, A. A. Stephens, Jesse Stephens and B. Kornfeld.—J. N. L.

CINCINNATI, OHIO

JULY 6, 1915.

Most of the business of the metal trades in this vicinity continues to be derived from war orders of one sort or another. The various tool shops, and the foundries which secure business from them, are rushed as never before, manufacturing machine tools and munitions of war, some manufacturing one, some the other, and not a few both. Inasmuch as these industries, which are among the most important in Cincinnati in normal times, constitute an important factor in the metal trades, it may very well be said that things are in an extremely satisfactory state as far as the brass people are concerned. Of course, it is realized that the goods being produced are of a destructive rather than of a constructive nature, and that the business, therefore, can hardly be said to be of a truly healthy sort; none the less, it is business, and inasmuch as the war has destroyed every other kind, the foundrymen feel that it is only fair that it should also produce something to take the place of peaceful work. Just at this time, moreover, with the high prices of copper produced by the war, the coppersmiths relying upon exclusively industrial work, such as distillers' equipment, would have extremely little to do, as the state of the distillery trade coupled with high prices, is such as to discourage that kind of work. Work resulting from war orders is therefore especially welcome to this branch of the trade, and inasmuch as indications are that it will keep up for many months, and possibly for several years, prospects for continued good business are excellent.

A receiver has been appointed in Cincinnati for the Van Wyck Machine Tool Company, on the suit of the Buckeye Foundry Company, which makes its claim on an unpaid note for $1,615.50 and on an open account for material. It is alleged in the suit that the company has on hand such a large contract for the manufacture of lathes that its finances are inadequate to handle the business, and that the receivership is necessary to prevent trouble. Receiver Harry C. Busch states that there is no connection between the war and the big order referred to.

The Republic Iron & Steel Company, of Youngstown, Ohio, is reported to have received a check for $27,000 from a rather unusual source, being the proceeds of the sale of zinc dross skimmings from its galvanizing pots. Up to a few months ago this material was regarded as being just barely worth saving, being worth considerably less than spelter and requiring refining to secure the valuable part of it; but with the recent increase in the price of zinc the dross became much more valuable, selling around $4.68 per 100 pounds, and enabling the company to dispose of the accumulations at a very handsome figure.—K. C. C.

LOUISVILLE, KY.

JULY 6, 1915.

Business with the coppersmiths of Louisville has been somewhat quiet during the past month. The high price of copper is said to be largely to blame for the bullishness which at present exists in the trade. Large manufacturers who use quantities of copper castings are placing only such orders as are for immediate consumption, and all unnecessary casting has been set aside until such a time as the copper market will warrant the expenditure. None of the Louisville concerns are getting any of the orders for brass or copper munitions of war which are being made in various parts of the East. Distillery work continues rather quiet, and the outlook is not very bright for either new or repair work in Kentucky. A few small fruit stills may be erected in parts of Indiana, Arkansas, and even in Kentucky to take care of the enormous fruit crop which will be gathered. However, the grain distillers are uneasy about the 1916 session of the state legislature and also of national prohibition, and are not thinking of making any improvements until things become more settled.

Articles of incorporation have just been filed by the C. Lee Cook Manufacturing Company with a capital stock of $50,000 divided into 500 shares at the par value of $100, fully subscribed. The incorporators are C. Lee Cook, president, 494 shares; and William J. P. Schoeffler and William Furlong, each with three shares. The corporation proposes to do a general manufacturing and machine shop business and is authorized to incur an indebtedness not to exceed $100,000. The concern has been specializing for some time in the manufacture of metallic packing. It is understood that the company has just received a large order for bronze bushings to be used by one of the Allied countries of Europe for lathes for making cannon and other war supplies.

The new plant of the Columbia Sanitary Manufacturing Company has started operations. The concern will manufacture enamel ware and a general line of plumbers' goods. George and Phil Laib, who are at the head of the Laib Company, a large plumbing supply house of Louisville, are also at the head of the new concern.

Business continues slow with the Independent Brass Works, according to Manager J. W. Rademaker. Mr. Rademaker reports that the casting business will continue slow as long as metal is at its present high price.

C. J. Thoben, of the Vendome Copper & Brass Works, reports that at present the company is handling very little local work, but is very busy on some large distillery contracts in the south. Large lumber concerns throughout the south are now putting in special machinery to convert saw mill waste into marketable by-products such as wood distillates, etc. Stills are also being erected to use up black strap molasses, fruits, berries, etc. Southern business has picked up remarkably during the past year and has helped out the local men considerably.

W. P. Davis, the well known metal broker of Louisville, reports that copper has remained almost stationary around twenty-five cents since the latter part of May. The demand for sheet copper, brass, rods, etc., is rather light just now, and the outlook is not what it might be. No ammunition or war supply orders are being placed in the southern district, and the only aid this business has been to the coppersmiths in this section is to advance prices on all copper goods and give the local men a chance to take a vacation.

The Standard Sanitary Manufacturing Company has been very busy in its brass plumbing goods department, and has been advertising for extra buffers, burnishers, polishers, etc. Business with the Standard Company has picked up somewhat since the season advanced.

Due to the high price now being obtained for old brass and copper, pilfering has been strongly in evidence in Louisville. The police department recently captured a wagon containing five sacks of brass boxings, couplings, etc., which had just been taken from the large brass foundry of the Louisville & Nashville Railroad.

The American Zinc Company, of Tennessee, has purchased the Roseberry zinc property at New Market, Tenn., from the Graselli Chemical Company, of Cleveland, Ohio. A quantity of machinery and equipment is already on the property which has been partly developed. General repairs will be made and a new 400-ton mill installed at once. The property consists of twenty-nine acres of land. The sale price was $93,000.

The Tennessee Copper Company, of Ducktown, Tenn., and No. 2 Rector street, New York, is reported to be contemplating the addition of another unit at the plant at Ducktown. The idea will be to increase the present supply of sulphuric acid manufactured by about one-half. The present output is about 1,000 tons, but additional supplies are needed to supply the E. I. Du Pont de Nemours Powder Company, of Wilmington, Del., which is doing a tremendous business.—J. D. C.

TAMPA, FLA.

JULY 6, 1915.

The Palmetto Machine Works do general manufacturing in iron, bronze and brass, their principal line being boat propellers, brass railings, etc.

The Tampa Foundry & Machine Company have the principal business of the city in the line of centrifugal pumps and dredges.

C. H. Thompson is now the sole owner of the Dixie Machine Company, he having bought it from the Bigelow Machine Company. The plant is in charge of C. D. Thompson, and considerable brass foundry work is done.

Karl L. Harter, manufacturing jeweler, expects to install a plating plant.

The Sunlight Manufacturing Company, of Central avenue, have gone out of the plating business temporarily. They manufacture brass light and lamp accessories, and are doing considerable oxydizing. They state that they may go actively into the plating business later on.—H. S.

JACKSONVILLE, FLA.

JULY 6, 1915.

The Mains Iron Foundry of South Jacksonville, are now going strongly into brass, bronze and aluminum castings and are doing considerable in the line of gas engines, cylinders and parts. They have had excellent results with brass and bronze bearing metal.

Perry Atkins of East Duval street, is organizing a carbide gas company, and will put in a plating plant.

The Consolidated Engineering Company, a new concern at 20 Ocean street, in charge of F. H. Downs, has installed a job plating plant, which will be in charge of W. H. Jackson.

The Richardson Company, which has been in business only a short time at 903 Main street, doing general plating work, expect to put in more machinery and equipment and to manufacture some lines in the fall. I. H. Carr, who was formerly with the Southern Plating Works, at 506 Market street, San Antonio, Tex., is now in charge of the Richardson Company's plating plant.

One of the principal items in the metal line is turpentine stills, condensers, pipes, coils, etc. This is an important branch of the industry. M. T. Brown and G. W. Southerland have completed a device for cooling the vapor from turpentine stills. It is claimed that it will revolutionize the naval stores business. The new condenser, it is said, will save from two to three gallons of spirits at each charging of the still, has a fifty per cent. larger cooling surface and does not occupy more than one-half of the space required under the old-time worm and tank method. The apparatus is made entirely of copper and can be installed on the present stills and has been a success so far. The inventors are constructing several of the condensers at 19 south Main street. Patents have been applied for.

The Pioneer Electro Plating Company, Miami, Fla., which was in charge of Fred W. Gleim of New York City, but who has gone to take charge of a plant at Hot Springs, Ark., is now under the supervision of J. Franklin, of Detroit, Mich. While Mr. Gleim was with the company he discovered a new process for nickel plating aluminum. A. J. Sharer is the owner of the Pioneer plant and they are doing considerable automobile work, plating hotel silver, and expect to add a lot of new machinery, lathes, dynamos, tanks, etc., and enlarge generally.

The Florida Metal Products Company are big manufacturers of various lines and are large users of copper, brass, tin, aluminum, galvanized iron, etc. Their business is strongly on the increase and is one of the important industries of the city. They manufacture a varied line of goods and there is not much in the metal line that they do not undertake.—H. S.

TRENTON, N. J.

JULY 6, 1915.

That there is confidence of returning prosperity and an improvement along the metal industry lines is shown in the fact that three Trenton concerns have been and are building additions to their plants. The concerns who will enlarge are the Trenton Smelting and Refining Company, J. L. Mott Company and the Mercer Automobile Company. The Mercer Auto Company has given a contract to the Bugbee Construction Company for a new structure 60 by 400 feet of glass and steel construction. This will add 2,400 more feet of floor space. The assembly department will be located in this new building.

The Jordan L. Mott Company will erect two structures to its big plant. The Bugbee Construction Company will do the work for $12,000. One of the proposed structures will be 35 by 180 feet and will be used for the installation of six oil heating furnaces. These will be made by the W. S. Rockwell Company, of New York, and will be used solely for the manufacture of munitions for the Allies. The big structure, where all the war munitions will be turned out completed, is well under way. In the meantime munitions are being turned out in the different other departments. The brass shop was "doubled up" and every inch of available space used for getting ready for the big war order. The company is also having installed nineteen automatic machines for cutting brass. A night force is now employed in making the necessary tools to be used on this order, and forty new lathes are being added to the brass department. Sample shells have been turned out and carefully sent to the firm which gave the Mott Company the sub-contract for the same. Considerable brass will be required on this order for shells and this will be melted in the nineteen new furnaces being installed. A 500-foot railroad spur has been run into the yards to connect with the brass department. Another improvement is the addition of extra blowers and the raising of the roof of the brass shop to comply with the New Jersey state law on sanitation. Aside from the war munition order the company expects general business to pick up during the remainder of the summer and early fall. The employes are getting in more time in the various departments and this is a sign of encouragement to the officials.

The Billingham Brass and Machine Foundry is experiencing busy times at the present and expects business to be pretty good from now on. The company has several new orders for a general line of brass goods which will keep the plant busy for the summer months. Several brass workers were given employment during the past month. Philip Billingham, the president, says that he believes the fall trade in the metal line will be good. "It is a little early to predict much," he said, "but I have some orders in view that I believe I will eventually get by fall."

Business continues good at the Trenton Brass and Machine plant and the management believes that the fall outlook is bright. The company is turning out considerable work for a trolley car manufacturing concern in Philadelphia.

The McFarland and Machine Company reports business picking up slowly, but is unable to give an opinion of the fall trade outlook.

John W. Metz, of the National Electro Plating Works, reports business dull at the present time. "Our business runs in streaks," he said, "and while we have been very busy all winter and spring we find things slack just now. Lately I had to lay off some employes, but am hopeful that business will pick up before fall.—C. A. L.

NEWARK, N. J.

JULY 6, 1915.

Business in Newark continues spotty and manufacturers are marking time. Many conflicting elements enter into an analysis of the metal industry situation, as well as other lines. A statement that would accurately describe the conditions, as a considerable portion of the trade finds them, might appear entirely inaccurate as to another equally large part of the trade. Some manufacturers say business is dead and are pessimistic as to the future, others report that it is quiet, but that there is generally a better feeling in the trade, while still others say they have been quite busy and look for a good business when fall comes. Inquiry among a large number of manufacturers show that more of them are doing "a little better" than for some time before. "A better feeling in the trade" is the report which many give. Collections are almost universally reported as slow, though a few report them fair. Comparatively few of the regular metal factories have war orders, but it is said that several of the electrical and chemical companies are very busy getting out this kind of work. While in general it may be said that there is a little more business and a considerably better feeling in the trade, there still seems to be enough of lack of confidence to cause manufacturers to act conservatively, even though they are optimistic of the future. Many of the local factories closed down on July 3 for periods of from four or five days to two weeks for their semi-annual or annual overhauling of engines, machinery, etc., and for necessary changes and alterations.

The Lafayette Manufacturing Company, Lafayette and Liberty streets, makers of metal toilet and manicure sets, reports a good business at present, the total for the past spring being greater than for the corresponding season last year. It has been better of late than earlier in the year.

Hodecher Bros., electro-platers and polishers at 373-375 Market street, have increased their plant so that it is capable of turning out three times as much nickel plating as formerly. Hodecher Bros. had an opportunity to bid on war goods, but did not think it would pay them to fit up their factory for turning out a special product, the demand for which might cease at any time.

The brass foundry of the Edward Zusi Company, Mechanic street, is on full time, and business is reported quite good, some improvement being noted lately. Collections continue to be slow.

F. G. Allen, manager of Crane & Company, 80 Mechanic street, reports that business is a little ahead of last year with his firm, but that it is not what it ought to have been had business developed normally during the past year.

Charles W. Park, manufacturer of silver goods at 109 Oliver street, notes some improvement in business and is considerably busier in his factory.

H. Gardner, worker in silver, brass, copper, German silver and Britannia at 109 Oliver street, has just invented a malto-food shaker for mixing eggnog, malto-foods, etc., for which he has a patent pending. The shaker is made of aluminum. Several large orders have already been received by Mr. Gardner.

Ewald Dietz, enameler at 355 Mulberry street, reports that business is quiet with him. George McAleer, electroplater at 355 Mulberry street, finds business improving a little. At the office of the Keystone Manufacturing Company, Inc., 391 Mulberry street, the following statement concerning the state of business was made: "Business is fair and we are getting our share, but conditions are not what they ought to be. We ought to be doing much more than we are at present. We are doing like most of the other manufacturers, proceeding conservatively until there is more confidence. Collections are very slow."

The outlook for better business in the fall is considered good by Unger Brothers, manufacturing jewelers and silversmiths at 412 Halsey street. They report that there has been a little real improvement in business the last few weeks, and that there is a better feeling in the trade.

The A. F. Conery Company, manufacturers of polishing brushes, buffs and supplies in Oliver street, find business improving a little.

E. Jost's Sons, Dickerson street, manufacturers of brass goods for steam, water, gas, oil, chemical and electrical purposes, report that while business is quiet at the present time there are indications of better business, which, however, is very slow in materializing.

The Harvey Osborne Silver Company, manufacturers of German silver goods in the Shiman-Miller building, Austin and Murray streets, has developed considerable trade with England since the European war began. The English market used to be supplied with the line this company is now selling to England by German manufacturers, but since the war began trade with Germany being cut off, the Harvey Osborne Silver Company has captured a part of it. Mr. Osborne, of the firm, does not expect to be able to hold this particular trade after the war has ended, because Germany is able to make the goods cheaper than they can be made in the United States.

J. E. Ferriday, lapper and polisher at 50 Columbia street, reported that despite the general slackness in business he has done better the past spring than for the two years preceding. Yaeger Brothers, nickelplaters, buffers and polishers, state that business has been a little quiet with them during the spring, but that at the present time it is picking up some. Smith, Brannan & Strein, electroplaters and polishers at 109 Oliver street, say that business is just fair, sometimes there being a rush for a few days and then a quiet spell. They report that it is much harder to get money than it is to get work.

The Newark Brass Company, 18-20 Lawrence street, is one of the concerns in the city which do not seem to be adversely affected by general business slackness. This firm has had a normal business all through the spring, it reports, and collections have been fairly good. The firm had a large quantity of brass on hand when the European war broke out and secured more before the prices reached the present high point, so that it has not had to raise the price of its goods to its customers.

Business is reported as good at the office of the J. H. Sommer Metal Company, manufacturers of metal specialties at 97 Chestnut street. R. E. Stolber has been visiting the trade through New York State and other points throughout the east in the interest of the concern with very successful results, while C. F. Burd has been visiting the trade in the Middle West.

Placards announcing the opening of new classes at the Newark Technical School have been posted in the various factories about the city. The day classes are to open on the third Tuesday in August, and the night classes will open on the first Monday in October. Among the courses offered are the following: General technical, decorative design, machinist, foundry practice, tool making, electricity and electroplating.

The three-story building at 101-103 Arlington street, has been leased for a long term by the Matthews Company, manufacturing silversmiths.

William Seibel, of 535 Hunterdon street, and William Lubetton, of 106 Spruce street, who are engaged in the electroplating business at Columbia and Green streets, have filed as their trade name the New York Plating Company.

B. J. Riley, of the B. J. Riley Manufacturing Company, 249 New Jersey Railroad avenue, reports that business has been good during the spring until within the past few weeks, but that it is rather quiet now. The present quietness, he reports, is not due to the fact that there are no orders, but to the fact that brass, spelter, nicolite and other metals have gone so high in price, due to the fact that such quantities of these metals are used in the manufacture of cartridges or other munitions of war which are being made in the United States for the war in Europe. Many inquiries are being received and customers continue to send in orders for goods at what has been the regular prices of the firm, but on hearing of the rise of price of the firm's goods, due to the rise in price of the basic metals, most of the would-be customers decide to wait awhile for a possible reduction in price. Mr. Riley stated that he was recently offered 19 cents a pound for scrap nicolite for which he usually got 4 cents. Until the prices rose he only paid 13½ cents for the new metal. He states that the present is the first time that he can remember in the fifty years that he has been in business that low brass is cheaper than high brass. There is so much spelter in high brass that it now brings about as much more than low brass, and low brass usually brings more than high brass.

Joseph Liebstein, 79 years old, of 267 Clinton avenue, who conducted a metal business here for years, which is now known as J. Liebstein & Sons, Inc., and located at 1226 Broad street, was killed by a jitney bus on June 19. R. B. M.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Bosch Magneto Company, Chicopee, Mass., is receiving bids for the construction of a two-story 170 x 250-foot brick and steel factory.

The Phillips Insulated Wire Company, Pawtucket, R. I., has awarded the contract for the construction of a one-story 60 x 100-foot machine shop.

Charles D. Durkee & Company, 2 South Street, New York City have recently installed a Galvanizing Plant in their works at Grasmere, L. I., N. Y., Mr. J. Howard Vail installed the plant.

The Taunton-New Bedford Copper Company, New Bedford and Taunton, Mass., has secured a building permit for a small addition to its melting plant, which will be used for the installation of two furnaces.

The Capital City Plating Works Company, Albany, N. Y., are putting up a new building at Tivoli and North Pearl streets. The company states that they will not occupy it at present, but will rent it for some time.

The Baltimore Tube Company, Baltimore, Md., has awarded a contract for a one-story casting shop, 37 x 62 feet, to cost about $6,000. Besides the casting shop this company operates a tube mill and tool and grinding room.

Work has been started on the construction of a one-story brick and steel building, which will have two bays each 60 feet wide, and one 400 feet long and the other about 225 feet long, for the Farrel Foundry & Machine Company, Ansonia, Conn.

The North & Judd Company, New Britain, Conn., manufacturer of hardware, has awarded the contract for the construction of a five-story 52 x 146-foot brick factory on East Main street, and a one and one-half, 42 x 110-foot addition to the present building.

The Union Manufacturing Company, New Britain, Conn., manufacturer of chucks and castings, has awarded the contract for the construction of a five-story, 47 x 160 foot, brick factory, which is intended to replace an old one. They state that they have all the equipment required.

The William Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa., has awarded a contract through the Hoffman Engineering & Contracting Company, for the construction of a pattern storage building, to replace one recently destroyed by fire. H. W. Scott is plant engineer.

The Skinner Chuck Company, New Britain, Conn., is occupying its additional building, which makes the main factory, 54 by 315 feet, four stories. The company make a specialty of chucks for brass workers, and at present are very busy with orders for chucks used in the manufacture of projectiles.

Mr. C. D. Bennett, who was for many years connected with the Bennett-O'Connell Company, Chicago, Illinois, has become affiliated with the Crown Rheostat & Supply Company, manufacturers of Rheostats, Dynamos, Plating and Polishing Material with headquarters at 15-17 So. Desplaines Street, Chicago, Ill.

The Moller & Schumann Company, Brooklyn, N. Y., manufacturer of Hilo varnishes, enamels, and japans, announces that J. A. Bremner resigned the management of its San Francisco branch office, June 1. P. H. Peterson, connected with that office since 1910, assumes charge as the Pacific coast manager.

The Terry Steam Turbine Company, manufacturers of steam turbines, Hartford, Conn., announce the appointment of Joseph Battles, with offices at 326 First National Bank Building, Denver, Colo., as district sales manager for Denver, covering the states of New Mexico, Colorado, Wyoming and the western portion of Nebraska.

The Eureka Pneumatic Spray Company, 62 Ninth avenue, New York, announce that to meet the demand for a low-priced sprayer, they have put on the market a complete spraying outfit consisting of compressor, air tanks, gauge, safety valve, tank draincock, air filter, one sprayer and a length of hose, all of which is sold at the price of $33.

The Wayne Brass Foundry Company, Pittsburgh, Pa., have purchased property at 4639 Butler street, which will be used for an addition to the company's plant. The company states that this is the second time within three years that they have found it necessary to expand on account of increasing business. Besides a brass foundry they also operate an aluminum and bronze foundry.

Plans for the new chemical laboratory building of the Bureau of Standards, Washington, D. C., have been completed. Its maximum cost is $200,000 and advertisements for bids for its construction will be published in June. It is to be located on Pierce Mill road in the northwestern suburbs of Washington, and will form the seventh of the group of special laboratory buildings erected for the bureau.

An unusual record has been established by L. F. Grammes & Sons, the metal goods manufacturers of Allentown, Pa., who state that for the past 35 years they have never been compelled to lay off any of their force or reduce their running time on account of lack of work and that even during the present unfavorable conditions they have managed to keep going full time and with a full force.

H. S. Wyckoff announces that he has purchased the machinery, equipment and stock of the H. S. Wyckoff Company, 269-270 Broome street, Newark, N. J., and will continue the manufacture of high grade vienna lime, tripoli, emery paste, rouge, etc., and handle a full line of platers' supplies at that address. One of the old company's specialties which will be featured is their substitute for potash which Mr. Wyckoff states has met with great success in the plating trade.

The Bay State Brass Rail Company, manufacturers of brass rails, and brass founders and finishers, 36 Broad street, Boston, Mass., has been incorporated for $10,000. The incorporators are: John F. Williams, George A. Macdonald, James P. Clare, George F. Spearin and Louis Wernicke. Some of the different departments operated by this company are a brass, bronze and aluminum foundry, brass machine shop, casting shop and spinning, soldering, plating and polishing departments.

Activity in the manufacture of munition for the European war among Canadian manufacturers now embraces over two hundred factories which are making the complete shells or brass parts for shrapnel. The orders are placed through a shell committee with headquarters in Montreal. At the present time this committee has let contracts amounting to $200,000,000. Shipments of ammunition are now going forward from Halifax every week. Arrangements have been completed at Sydney, N. S., and at Sault Ste. Marie for refining copper and zinc and the manufacture of brass for shells. Heretofore the refined materials have been from the United States.

The Jackson Iron & Bronze Works, Jackson, Tenn., report through I. A. Rainey, secretary and manager, that additional stock of that company to the amount of $30,000 has been sold, all of which is to be paid in at once, and that application has been made for the amendment to their charter in order to provide for $500,000 of common stock. Their factory consists of a machine shop which includes departments for tools, grinding, brazing, soldering, polishing, lacquering, machining and fabricating all kinds of plain and ornamental metal work, a plating and galvanizing plant, a forge shop, and a foundry equipped for making bronze, brass and aluminum castings. In addition to what they already are doing the company have concluded to do general foundry business and repair work and handle a complete line of mill supplies.

Mac Cluer & Bell, 185 Madison avenue, New York, have been appointed American representatives of the Coslett Anti-Rust Syndicate, Ltd. The process of coslettizing was first described in THE METAL INDUSTRY in May, 1911, and since then references to its progress have appeared at various times. In 1914 important improvements were made which enables the producers of this finish to secure a beautiful glossy black surface said to be absolutely rust proof and permanent.

Mac Cluer and Bell have established a demonstrating plant at Milburn, N. J., and announce that they will be pleased to Coslettize sample articles free of charge, in order to demonstrate what can be done with this process. A number of prominent American concerns which have been using the Coslettizing process for years are the Westinghouse Electric Company, North & Judd Manufacturing Company, Remington Typewriter Company and Yost Typewriter Company.

One of the heaviest buyers of copper, zinc and heavy scrap brass this past week has been one of the Canadian brass manufacturers, who has booked increased orders for brass parts used on shrapnel shells.

The Canadian brass manufacturing plants along the border are now running to their full limit and some of them have put on a night force in their foundry and finishing departments, all working on war materials. The recent statement published in the press by Gen. Sir John French to the effect that the war has narrowed down to a point where ammunition supplies are the deciding factor indicates clearly the extent to which Canadian manufacturers have turned their plants into the manufacture of these goods and are profiting from the situation and are now in a position to handle the business and are working at top speed.

The United States Steel Corporation, has announced through Chairman Gary, that it will build at Donora, Pa., a new plant for the manufacture of zinc and by-products, including sulphuric acid, at a cost of from $2,500,000 to $3,000,000. Chairman Gary says in connection with this announcement.

"We have been buying of other manufacturers, but as there has been some difficulty or, at least, delay in supplying our necessities, we have reached the conclusion to proceed at this time.

"The market for the products of the plant is largely in the Pittsburgh district, and for this reason and the further reason that it is a good point for the assembly of raw materials, we have selected this location. We hope to be able to start operations on or before the first of next January."

The new Donora plant will mean a very considerably increased purchase of zinc ores by the Steel Corporation. The corporation is at present a producer of spelter through its subsidiary, the Edgar Zinc Company, which is a tributary to the American Steel & Wire Company, at Cherryvale, Kansas. The zinc company has a plant consisting of 4,800 retorts. A similar plant at Carondelet, Mo., has 2,000 retorts. Production of spelter at these plants was 28,031 tons in 1914, 30,424 tons in 1913 and 31,318 tons in 1912.

$25,000,000 ZINC MELON

The New Jersey Zinc Company is planning to increase its capital from $10,000,000 to $35,000,000 and to distribute the $25,000,000 increase to stockholders in the form of a stock dividend of 250 per cent. A special meeting of stockholders to authorize the dividend was called for July 7, but at time of going to press further particulars were not available.

The company is the largest single producer of zinc in the country, and two of its grades of the metal are said to be the most sought after for commercial purposes. So far this year dividends amounting to $20 per share have been paid, and the annual disbursement in the last three years has been $50 a share. The management said in announcing the forthcoming dividend yesterday that it would be taken from the surplus, which is unofficially estimated at about $50,000,000.

REMOVAL

Philip Sievering, the well-known job plater of New York City, recently moved into new quarters at Centre, Broome and Lafayette Streets, where he has the largest jobbing facilities in this part of the country. Mr. Sievering makes a specialty of contract work for manufacturers, in plating polishing, dipping, lacquering, barrel plating and tumbling. With 9,000 square feet of floor space and accommodations for 38 polishers and a corresponding number of employees in other departments, he is able to take care of the largest contracts satisfactorily. As a reminder of the fact that he has moved to new quarters, he is getting out a useful souvenir in the form of a celluloid rule which is graded by inches and also by the metric system and which he will be glad to send to any manufacturer who would like to have one.

INCREASE IN CAPITAL STOCK

The Metalwood Manufacturing Company, manufacturers of hydraulic machinery and equipment, Detroit, Mich., has increased its capital stock from $100,000 to $155,000.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

To deal in hardware—J. Blumberg Company, Bayonne, N. J. Capital, $42,500. Incorporators: Aaron Blumberg, Samuel Blumberg and Jacob Blumberg, all of Bayonne, N. J.

To manufacture novelties and specialties—New-Hunt Company, Newark, N. J. Capital, $5,000. Incorporators: Charles Clark, New York City; J. B. Fitzpatrick and W. L. Jacobus, Newark.

To mine and manufacture—The Dirigold and Metals Company, Newark, N. J. Capital, $150,000. Incorporators: Russell S. Davis, Newark; Carl Nelsen, Newark; George H. Hinnan, New York City.

To manufacture dies and sheet metal stampings—The Detroit Stamping Company, Detroit, Mich. Capital, $10,000. Incorporators: W. H. Roberts, Fred Haskel, Earl W. Roberts and T. Herbert Roberts.

To manufacture metal specialties—Cadwell-Vernon Company, Inc., Jamestown, N. Y. Capital, $100,000. Incorporators: John C. Cadwell, Eugene B. Cadwell, Dixon S. Vernon, Frank S. Vernon and Wilson C. Price.

To manufacture electric lamps—Beaver Electric Lamp Company, Newark, N. J. Capital, $100,000. Incorporators: Edmund Beatty, Newark; Frederick Rosseter, Irvington, N. J.; Philip Dreyfuss, Rutherford, N. J.

To manufacture brass carburetors—Manufacturing and Sales Company of the Float-Jet Carburetor, Newark, N. J. Capital, $300,000. Incorporators: Siegfried Leschinger, Charles F. Kraemer and James M. Reilly, all of Newark.

To manufacture metallic alloys of all kinds—The Silvel Metal Corporation, New York, N. Y. Capital, $600,000. Incorporators: W. L. Clark, president; William H. Davis, vice-president; William M. Smith, secretary, and F. S. Tuttle, treasurer.

To manufacture automobile accessories.—The R. T. W. Auto Accessories Company, Detroit, Mich. Capital $20,000. Incorporators: Robert T. Williams and Ray C. Cowan. This company will operate a brass machine shop, tool and grinding room and japanning department.

To manufacture brass mouldings and do engineering work. J. E. Vroman Company, Union Hill, N. J. Capital, $100,000. Incorporators: Julius E. Vroman, North Bergen; Leontine Vroman, North Bergen, N. J.; George W. Bechtold, Jersey City; William V. Bechtold, Jersey City.

To do a general electro-plating business—The William L. Shaughnessy Company, Gardner, Mass. Capital, $50,000. Incorporators: William L. Shaughnessy, president; James Shaughnessy, vice-president; Thomas Denny, secretary and William L. Shaughnessy, James Shaughnessy and Eugene Fields, directors. Alterations are being made on the company's building to make room for the increasing business and the number of workmen has been increased from 27 to 50 men.

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

PRINTED MATTER

Blowers.—The Clarage Fan Company, Kalamazoo, Mich. have recently published a catalog describing Clarage Type C. I. cast iron volume blowers. These fans are built in four sizes, No. 5, 6, 7 and 9, and the number in each case is the same as the diameter in inches in the suction or outlet connection.

New Process Soap Cleanser.—Fansher Brothers, 18-24 Benton street, Dayton, Ohio, are sending out a leaflet giving directions for the use of their "New Process Soap," which, they claim, is better than alkali or electric cleaners for cleansing metals before plating or lacquering. They state that this soap has been used on a large scale for a number of years by the National Cash Register Company and that they are now ready to supply it to the trade in general.

Slotting Machines—The Newton Machine Tool Works, Philadelphia, Pa., have issued catalog 49 giving full description and illustration of the Newton slotting machines. This catalog presents a complete line of standard and special slotters. The smaller sizes are crank driven, while the larger sizes are operated by screw, or rack and pinion. As the company is constantly bringing out new designs they will be pleased to furnish detailed information, weights and prices upon application.

Hardware Specialties.—The Richards-Wilcox Manufacturing Company, Aurora, Ill., have issued a very comprehensive catalog No. 12, consisting of 296 pages, giving full description and illustrations of their line of door hangers, grindstones and hardware specialties. This is claimed to be one of the most complete hardware specialty catalogs ever published and anyone interested in this line of goods will do well to send for a copy, as the issue is now ready for distribution.

Paint.—An interesting pamphlet has been issued under the title of "Painting Defects, Their Causes and Prevention," which consists of an address given by G. W. Thompson, chief chemist, National Lead Company, New York, before the Institute of Chemical Engineers, December 3, 1914. In this pamphlet the various reasons why paints fail are clearly explained and advice is given for the prevention of same. Any one interested in the characteristics of paints should read the address.

Polishing Lathes.—Ball bearing polishing lathes are illustrated and described in a new booklet just issued by the Gardner Machine Company, Beloit, Wis., manufacturers of grinding and polishing machinery. These lathes, under the head of ball bearing polishing lathes, were first placed upon the market about three years ago. Since then various styles and sizes have been added to the line, which are all contained in the new catalog, copies of which may be had upon request.

Grinding Wheels—The Standard Grinding Wheel price list, effective July 1, 1915, has just been issued by Walter C. Gold, Philadelphia, Pa. This price list has been issued partly to correct inconsistencies existing in the old list and partly because, while the cost of manufacturing grinding wheels has materially increased in the last few years, no change has been made in price lists for over a quarter century. The average raise in the list prices of regular straight wheels is only about 1⅓ per cent.

Compressed Air Machinery.—The Blaisdell Machinery Company, of Bradford, Pa., have issued the first portion of their general catalog devoted to the production of compressor machinery. This book contains one hundred and twenty pages, and gives full descriptions and fine illustrations of single and duplex air compressors, valves, and other apparatus necessary for compressor installation. The Blaisdell Company will be pleased to furnish copies of this catalog to anyone interested in air compressing and vacuum machinery.

Brass.—The Indianapolis Brass Company, Indianapolis, Ind., have issued an attractive little folder catalog telling of their special bearing bronze bushings, automobile and accessory and general jobbing castings. They invite jobbers to send them patterns that are difficult to cast and they state that their plant is completely equipped to get out work at stated times at lowest possible prices. This company guarantees everything they make and if their products should prove unsatisfactory they may be returned immediately for full credit.

Guide to a Business Education—L. F. Grammes & Sons, Allentown, Pa., have issued an interesting little book of 265 pages which gives a list of over five hundred selected books relating to business and its administration gathered from all parts of the world. There is also a compilation of over three hundred business trades directories, invaluable for making up mailing lists for special purposes. Also all the telegraphic and cable codes are included. This little book would make a very valuable addition to the library of any manufacturing concern as it affords a ready reference to all of the literature extant on the subject of business.

Die Cast Parts.—The H. H. Franklin Manufacturing Company, Syracuse, N. Y., tell, in a very interesting manner, about the Franklin die cast parts in a new catalog which they are just now distributing. The catalog is illustrated with handsome half-tone cuts which show the numerous line of intricate die castings which the Franklin company are now turning out, which are the result of twenty-two years' experience in the business. The Franklin die castings are made from a tin and zinc base and are designed to meet practically all conditions to which they may be subjected. Copies may be had upon request.

Forcing Presses.—Catalog No. 92 has been issued by the Watson-Stillman Company, of New York. This is a sectional catalog and supersedes No. 70 and part of No. 82 and is devoted to hydraulic forcing and miscellaneous presses. Among the presses described in the catalog that might be mentioned are crank pin, armature, broaching, reversed cylinder die and forcing, and multiple cylinder projectile banding presses. There is also a department devoted to briquetting, powder, carbon plug, lead and crayon presses, with a complete line of hydraulic draw benches and bulldozers. Copies of this catalog will be sent upon request.

Hydraulic Presses.—The Hydraulic Press Manufacturing Company, Mount Gilead, Ohio, have recently issued an attractive mailing folder on hydraulic pumps and valves which is known as bulletin No. 5,000. This folder is filled with descriptions of the extensive line of hydraulic pumps which this company manufactures for every pressure required. A page of the folder is devoted to a few types of hydraulic valves. Manufacturers are invited to submit their pump, valve and fitting problems to the engineering department of this company and an intelligent way to start out to do this is to first send for a copy of the folder and then decide which one of the many pumps illustrated will more closely fit local conditions.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW

NEW YORK, July 6, 1915.

COPPER.

The copper market was very active for the first two weeks in June and prices were advanced 1½ cents per pound from 19 cents, the large producers' prices on the first of June, to 20½ cents delivered terms for electrolytic on the 14th. This was the high point for the month. There was some big buying from 20 cents up to 20½ cents, and several hundred tons were sold at 20⅜ cents per pound cash f. o. b. New York for June, July and August deliveries. On the 15th of June the London price of electrolytic broke 10s., spelter and lead prices declined and copper consumers suddenly stopped buying. Several second-hand lots of copper were offered and prices gradually declined to 19½ cents per pound for spot and June lots cash f. o. b. New York.

Buyers continued to hold off and for the last half of the month there was very little business closed.

The exports for the month are very small, about 16,000 tons, against 32,000 tons a year ago and 28,889 tons in May.

The large producers held to their price of 20½ delivered, but they have practically had no orders; other dealers were sellers on the 15th at 20¼ delivered terms, and later some few sales were made at as low as 19¾ delivered.

Prices today: Lake, 20 cents; electrolytic, 19¾, and casting at 18¾ cents.

TIN.

The statistics for the month were not very favorable, stocks for the month showed an increase of 1,400 tons and the total visible supply was 3,200 tons less than the same month a year ago.

On June 1 tin was quoted at around 40 cents. London speculators depressed prices for a time but consumers came into the market very freely and prices advanced to 42.50 on the 15th. This was the high point for the month; just about the same as the copper market, prices then gradually declined to about 39¼ cents at the close and futures are offered at 2 to 3 cents per pound less.

LEAD.

The lead market has been active and excited. On June 1 the trust price was 4.90 New York and the outside price was about the same. Dealers and speculators began buying wildly and the price of lead was rushed up to 7⅝ cents on the 14th. The trust on that day advanced their price to 7 cents; the outside market then was ⅝ cent per pound above the trust price. One day the price of lead in London declined 5s. and speculators here all began to unload and the market dropped rapidly to around 5.40 New York while the trust price was down to 5.75. The outside market, from being ⅝ cent per pound above the trust price, actually declined to about ⅜ cent per pound below the trust price. Today the market is steadier at from 5 to 10 points below the trust price of 5.75 New York. The buying movement was started on the report that lead was going to 10 cents. According to the American Metal Market and Daily Iron and Steel Report the price of lead was advanced to make a market for Federal stock. According to this Report lead on June 1 was 4.90 and Federal stock was $12; June 12, lead 7.75, Federal stock $60; June 19, lead 5.40 to 5.50, Federal $28. This stock jobbing manipulation is probably going to be investigated.

SPELTER.

The spelter market has had its ups and downs the same as copper and lead. Prime western was quoted on June 1 at 23.50 New York; brass special at 25 cents. Prices were advanced to 27.50 on the 4th. On the 7th consumers and speculators began selling at around 27 cents, and prices broke rapidly to 18.50 New York on June 22. The market on that day was rather steadier and prices after that began to advance again and at the end of June the market was firm at around 22 cents New York. Sheet zinc has been reduced 3 cents per pound to 27 cents.

The London price opened at £92 10s., advanced to £102 10s. on the 21st, then declined to £87 10s. on the 24th, and at the end of June closed at £102.

ANTIMONY.

From 40 cents per pound at the beginning of June for Chinese and Japanese brands the market is quotable today at from 36¾ to 37¼. The English market is firmer and the indications are that higher prices are likely to prevail.

SILVER.

The silver market has been very steady all the month and prices have fluctuated from 48 cents to around 49⅜ cents; closing at 49 New York.

ALUMINUM.

The market is firmer again, and after opening at around 27 cents prices are higher. For prompt aluminum as high as 31 cents has been paid and the market today is quotable at 30 to 32 cents, according to quantity and date of delivery.

QUICKSILVER.

The market has been quite active and prices are $21 per flask higher. The wholesale price today is $95 per flask and jobbing lots are quoted at $5 to $7 per flask higher.

PLATINUM.

The market is dull and the demand shows little improvement. The jewelry trade is very quiet but prices of platinum are about the same as a month ago. The ordinary refined is quoted nominal at $40 and the 10% hard at $42 per ounce.

SHEET METALS.

The prices of sheet metals are all more or less nominal owing to the recently active copper market. Sheet copper is quoted today at 25 cents base, copper wire at around 21½ cents, high sheet brass at 28 cents. It is to be noted that prices are rapidly pushed up on the advance of ingot copper, but on a soft, sagging market, prices are very slow in coming down.

OLD METALS.

The market for all kinds of copper scrap and white metals was active and higher during the first half of the month with the rapid advance in copper, lead and spelter, but with the collapse in prices the market is quieter again and prices are a shade under the highest.—J. J. A.

JUNE MOVEMENTS IN METALS

	Highest.	Lowest.	Closing.
COPPER.			
Lake	20.75	19.00	20.00
Electrolytic	20.65	18.75	19.75
Casting	19.65	17.50	18.90
TIN	43.00	37.70	39.75
LEAD	7.65	4.90	5.75
SPELTER	27.50	18.50	22.50
ANTIMONY (Chinese and Jap.)	38.00	35.00	37.00
SILVER	49⅝	48.00	48.00

WATERBURY AVERAGE

The average prices of Lake Copper and Brass Mill Spelter per pound as determined monthly at Waterbury, Conn.:

1913—Average for year, 15.83. 1914—Average for year, 13.91. 1915—January, 14⅛. February, 15.25. March, 15.75. April, 18.50. May, 22.50. June, 22.50.

Brass Mill Spelter. 1915—January, 6.55; February, 11.85; March, 12.15. April, 13.85. May, 20.55. June, 25.60.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the Report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

Metal Prices, July 6, 1915

NEW METALS.

	Price per lb. Cents.
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER. Manufactured 5 per centum.	
Lake, carload lots, nominal	20.25
Electrolytic, carload lots	19.75
Casting, carload lots	18.50
TIN—Duty Free.	
Straits of Malacca, carload lots	39.25
LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots	5.75
SPELTER—Duty 15%.	
Brass Special, nominal	25.00 to 26.00
Prime Western, carload lots, nominal	22.50
ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	37.00
100 lb. lots, f. o. b. factory	35.00
Tons lots, f. o. b. factory	33.00
ANTIMONY—Duty free.	
Cookson's cask lots, nominal	....
Hallett's cask lots, nominal	....
Hungarian grade	36.50 to 37.00
NICKEL—Duty Ingot, 10%. Sheet, strip and wire 20% ad. valorem. Shot, Plaquettes, Ingots. Blocks according to quantity	48.00 to 50.00
ELECTROLYTIC—3 cents per pound extra.	
MANGANESE METAL	nominal
MAGNESIUM METAL—Duty 25% ad valorem (100 lb. lots)	nominal
BISMUTH—Duty free	3.00
CADMIUM—Duty free	1.90
CHROMIUM METAL—Duty free	.75
COBALT—97% pure	2.00
QUICKSILVER—Duty, 10% per flask	100.00
	Price per oz.
GOLD—Duty free	$20.67
PLATINUM—Duty free	38.00
SILVER—Government assay—Duty free	49½

INGOT METALS.

			Price per lb. Cents.
Silicon Copper, 10%	according to quantity		29 to 31
Silicon Copper, 20%	"	"	31 to 34
Silicon Copper, 30% guaranteed.	"	"	33 to 38
Phosphor Copper, guaranteed 15%	"	"	28 to 32
Phosphor Copper, guaranteed 10%	"	"	27 to 30
Manganese Copper, 30%	"	"	27 to 30
Phosphor Tin, guaranteed 5%	"	"	58 to 61
Phosphor Tin, no guarantee	"	"	46 to 49
Brass Ingot, Yellow	"	"	16 to 17½
Brass Ingot, Red	"	"	14½ to 16
Bronze Ingot	"	"	17 to 18
Manganese Bronze Ingots	"	"	27½ to 28
Phosphor Bronze	"	"	18 to 19½
Casting Aluminum Alloys	"	"	16 to 18

PHOSPHORUS—Duty free.
According to quantity ..... 30 to 35

OLD METALS.

Dealers' Buying Prices. Cents per lb.		Dealers' Selling Prices. Cents per lb.
16.50 to 17.25	Heavy Cut Copper	18.00 to 18.50
16.50 to 17.00	Copper Wire	18.00 to 18.25
14.00 to 15.00	Light Copper	15.50 to 16.00
14.00 to 15.00	Heavy Mach. Comp.	15.00 to 15.50
12.00 to 12.50	Heavy Brass	13.50 to 14.00
10.00 to 10.50	Light Brass	11.00 to 11.50
15.00 to 15.50	No. 1 Yellow Brass Turnings	16.00 to 16.50
12.00 to 12.50	No. 1 Comp. Turnings	12.50 to 13.00
4.50 to	Heavy Lead	.... to 5.50
14.00 to	Zinc Scrap	.... to 16.00
5.50 to 6.50	Scrap Aluminum Turnings	9.00 to 12.00
11.50 to 12.00	Scrap Aluminum, cast alloyed	14.00 to 15.00
13.80 to 14.00	Scrap Aluminum, sheet (new)	15.00 to 16.00
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
17.00 to 23.00	Old Nickel	17.00 to 23.00

PRICES OF SHEET COPPER.

BASE PRICE, 25 Cents per Lb. Net.

SIZE OF SHEETS.		64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
Width.	LENGTH.	Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins., but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins., but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins., but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins., but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins., but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Not longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 3c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

ZINC— Duty, sheet, 15%.

	Cents per lb.
Carload lots, standard sizes and gauges, at mill....27 cent basis, less 8%	
Casks, jobbers' prices	32
Open casks, jobbers' prices	33

Metal Prices, July 6, 1915

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect July 2, 1915

To customers who buy over 5,000 lbs. per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.26⅝	$0.26½	$0.26⅞
Wire	.26⅜	.27	.27⅝
Rod	.26⅝	.27	.27¼
Brazed tubing	.30¾	——	.33½
Open seam tubing	.30¾	——	.33½
Angles and channels	.30¾	——	.33½

To customers who buy 5,000 lbs. or less per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.28⅛	$0.28½	$0.28⅝
Wire	.28½	.29	.29⅝
Rod	.28⅝	.29	.30
Brazed tubing	.32¼	——	.35½
Open seam tubing	.32¼	——	.35½
Angles and channels	.32¼	——	.35½

[Note.—Net extras for quality for both sections of above metal prices are not quoted due to the fluctuntions in the price of zinc.—Ed.]

BARE COPPER WIRE—CARLOAD LOTS.

21c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	24c.	per lb. base
100 lbs. to 300 lbs. in one order	24½c.	" " "
Less than 100 lbs. in one order	26c.	" " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, 32½c. per lb.
Seamless Copper Tubing, 30½c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.

⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
40½	39½	34½	33½	32½	32½	32½	32½	32½	32½	32½	33½	34½	36½	38½	39½

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet—	
	Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1¼ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount, 10%.

PRICE FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	34c.	net base
Munts or Yellow Metal Sheathing (14" x 48")	30½c.	" "
" " " " Rectangular sheets other than Sheathing	32c.	" "
" " " " Rod	30½c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 38½c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more 5c. over Pig Tin. 50 to 100 lbs. 6c. over, 25 to 50 lbs. 8c. over, less than 25 lbs. 10c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 4c. over Pig Tin. 50 to 100 lbs. 5c. over, 25 to 50 lbs. 7c. over, less 25 lbs. 9c. over.

Above prices f. o. b. mill.

Prices on wider or thinner metal on request.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Gauge.	Width. Inches.	1 ton.	50 to 2,000 lbs.	Less than 50 lbs.
20 and heavier	3-30	25.9	26c.	29c.
	3-30	26.9	27c.	30c.
21 to 24 inclusive	30-48	28.9	29c.	32c.
	48-60	31.9	32c.	35c.
25 to 26	3-30	27.9	28c.	31c.
	30-48	29.9	30c.	33c.
27	3-30	28.9	29c.	32c.
	30-48	31.9	32c.	35c.
28	3-30	29.9	30c.	33c.
	30-48	32.9	33c.	36c.
29	3-30	30.9	31c.	34c.
	30-48	34.9	35c.	38c.
30	3-30	31.9	32c.	35c.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. No charge for boxing. F. O. B. Mill.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 22 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 in.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	26	23	..	..	13	11	9	8	15	22
12.	.109.	..	..	..	..	..	..	..	25	..	..	..	14	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	16	..	..	..	..	..
16.	.065.	..	..	..	..	..	27	26	26	23	22	20	20	20	20	26	30	56
18.	.049.	..	..	..	..	32	29	28	27	24	25	25	25	..	..	..	..	..
20.	.035.	116	..	45	38	33	32	31	29	28	29	29	29	30	37	45	57	80
21.	.032.	..	..	..	39	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	137	97	47	41	37	36	34	33	..	..	44	..	..	..	..	..	..
24.	.022.	187	132	107	87	78	72	61	59	65	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Price per lb. over 25 lbs., Diameter, B. & S. Gauge, No. 000 to 10 and 12, 26 cents. No. 12 to 20 inch, 28 cents.

BASE PRICE GRADE "B" GERMAN SILVER SHEET METAL.

Quality.	Net per lb.	Quality.	Net per lb.
5%	34c.	16%	38c.
8%	35½c.	18%	38½c.
10%	36c.	20%	41c.
12%	37c.	25%	49c.
15%	37½c.	30%	54c.

GERMAN SILVER WIRE.

Quality.	Net per lb.	Quality.	Net per lb.
5%	36c.	15%	42¾c.
8%	38c.	16%	43¼c.
10%	39¼c.	18%	45¼c.
12%	41¼c.	30%	60½c.

The above Base Prices are subject to additions for extras as per lists printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are considerably higher.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.